3.6 WETLANDS

3.6.1 Studies and Coordination

3.6.1.1 Data Sources

Wetland data were evaluated using existing information from a variety of federal, state, regional, and local sources. Digital Geographic Information System (GIS) information was available from the United States Department of the Interior (USDI) - National Wetlands Inventory (NWI), Washington State Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) program, and King County. These primary sources were supplemented using the following reference materials:

- I-405 HOV Lanes – Bothell to Swamp Creek Environmental Analysis (DEA, 1996);
- Snohomish County Stream and Wetland Inventory (1987);
- King County Sensitive Areas Map Folio (1990);
- King County Wetlands Inventory Volumes 1 – 3 (1990);
- City of Bothell Critical Areas GIS Map (2002);
- City of Bothell Critical Areas Map (1990);
- City of Kirkland Streams, Wetlands, and Wildlife Study (1998);
- City of Redmond Sensitive Areas Map (1997);
- City of Bellevue Sensitive Areas Notebook (1987);
- City of Kent Wetland Inventory Maps (1998);
- City of Kent Wetland Inventory Report (1990); and
- City of Renton Wildlife Corridor Study (1994).

The following USDI-NWI maps were used to cross-reference digital data from other sources and to assure that overlapping wetlands were given a United States Fish and Wildlife Service classification (Cowardin et al., 1979) if one existed:

- Mercer Island quadrangle (1988);
- Kirkland quadrangle (1988);
- Renton quadrangle (1988);
- Bothell quadrangle (1989);
- Issaquah quadrangle (1989);
- Auburn quadrangle (1988); and
- Redmond quadrangle (1989).

Additional cities were consulted to determine the nature and extent of wetlands within their jurisdictions. These cities include:

- City of Tukwila;
- City of Kenmore;
- City of Mountlake Terrace;

- City of Woodinville; and
- City of Newcastle.

Aerial photographs depicting November 1, 1999, conditions were available for most of the I-405 corridor. They were used to identify probable wetland resources absent from local inventories. These "absent" wetland resources were added to the digital wetland data set to develop a compilation of wetlands potentially impacted by the various alternatives. Secondary resources such as maps and aerial photographs do, however, tend to greatly underestimate wetland acreage and are of limited use in estimating wetland type and function.

Most of the available digital data were derived from sources created over ten years ago (e.g., King County and NWI data, which were developed using aerial photographs). Because of this, and the fact that limited field investigations were conducted during the creation of these data, the estimates of wetlands and acres impacted will vary between the programmatic and project-level phases. Some wetlands identified in the digital data set may have changed or been altered partially or fully by other projects. Furthermore, broad-scale wetland mapping used in this evaluation may miss smaller isolated wetlands not visible in aerial photographs. Although these limitations reduce the overall wetland details, comparisons of trends and potential impacts are considered acceptable at this programmatic level of analysis. On-site investigations will be an integral part of project-level analyses to refine wetland boundaries, types, and functions to determine potential project-specific wetland impacts, avoidance, and mitigation measures.

3.6.1.2 Agency Coordination

Resource agencies contacted included the U.S. Army Corps of Engineers (USACOE), WDFW, Washington State Department of Ecology (Ecology), U.S. Department of Interior - Fish and Wildlife Service (USFWS), and U.S. Department of Commerce - National Marine Fisheries Service (NMFS). Methodologies and strategies for impact assessment, avoidance, minimization, and mitigation were discussed.

3.6.1.3 Policies and Codes

The following wetland policies and codes are relevant to wetlands management in the study area. Policies and codes covering wetlands are complex in that numerous federal, state, and local jurisdictions manage wetlands differently, and various agencies may take jurisdiction over the same wetland depending on the location and degree of potential impact. The following list is not all-inclusive, but highlights many of the relevant policies and codes that have been put into place to protect wetlands and to achieve no net loss of wetlands:

- Federal Clean Water Act – Section 404;
- Federal Clean Water Act – Section 401;
- Federal Rivers and Harbors Act – Section 10;
- Federal Coastal Zone Management Act;
- National Environmental Policy Act (NEPA);
- State Environmental Policy Act (SEPA);
- State Growth Management Act (GMA);
- State Shoreline Management Act;

- State Water Pollution Control Act;
- State Hydraulic Code;
- State Forest Practices Act; and
- Local laws (county and city codes).

Additional measures designed to protect wetlands include Executive Orders such as 89-10 and 90-04 that relate to no net loss of wetlands, and may result in more stringent compensation ratios than required by other agencies. Furthermore, WSDOT Environmental Procedures Manual (Volumes 1 and 2) (WSDOT, 2001) outlines the issues and actions to be addressed prior to authorizing work that could impact wetlands within their right-of-way.

3.6.2 Methodology

Wetland resources identified from the above sources were compiled onto one set of 1”=1,600’ maps. The set of maps was then digitized and added to the original set of digital GIS data from NWI, WDFW, and King County to produce the final compiled wetland base map. Preliminary project plans were then overlaid onto the composite GIS wetland resources map using ArcInfo. Projects were identified as having potential wetland impacts when any portion of the road prism or other potential improvements overlapped the wetland boundary or wetland buffer.

The two primary measures used to evaluate wetland impacts were numbers of wetlands and estimated area of impact (in acres) affected by transportation improvements. Because of varying dimensions of facilities and the wide array of project elements associated with each alternative, several simplifying assumptions were made to estimate the potential impacts. These assumptions are outlined in Table 3.6-1 below. The “new improvement distance” is an estimate of the width of the new improvements from the centerline of the existing right-of-way. This width does not include auxiliary facilities such as stormwater best management practices (BMPs) that may require the acquisition or use of additional property within or adjacent to anticipated project improvements. The width accounts for only one side of the centerline. The “impact width” on the table indicates the difference in width between the distance needed for existing facilities and the new improvements. This distance is the anticipated “width of impact” extending beyond the existing transportation facility on each side. This approach resulted in a standardized and repeatable method of impact analysis.

The total acreage and number of wetlands (or portion of wetlands) potentially impacted by the improvements were calculated using ArcInfo Version 7.1.2. Wetland impacts were assumed to be conservative because some projects could actually span wetland areas rather than fill them, many wetlands could already be filled or heavily altered, and some wetlands could be impacted by multiple projects within the same alternative. In situations where a single wetland was affected by more than one proposed improvement, double counting of numerical – not acreage – impacts may have resulted. Furthermore, in some cases under the fixed-guideway high-capacity transit element, the creation of an additional railway line may not be required. Analysis totals from ArcInfo could not be corrected with reasonable effort. This resulted in the total impacts for individual improvement elements appearing to be slightly higher than the overall alternative impact totals.

Table 3.6-1: Summary of Improvement Impact Width Assumptions

Element	Existing Facility Distance from Centerline	New Improvement Distance from Centerline	Potential Impact Width
Arterial HOV	30 feet	45 feet	15 feet
I-405 HOV Direct Access	35 feet	50 feet	15 feet
Basic I-405 Improvements	90 feet	125 feet	35 feet
Add Two General Purpose on I-405 and Express Lanes	90 feet	125 feet	35 feet
Add One General Purpose on I-405	90 feet	110 feet	20 feet
Widen SR 167	90 feet	125 feet	35 feet
Connecting Freeway Capacity	35 feet	50 feet	15 feet
Planned Arterial Improvements	35 feet	50 feet	15 feet
North-South Arterial Capacity	35 feet	50 feet	15 feet
I-405 Arterial Connections	35 feet	50 feet	15 feet
I-405 Non-motorized Crossings	0 feet	7 feet	7 feet
Pedestrian/Bicycle Transit	0 feet	5 feet	5 feet
Fixed-Guideway High-Capacity Transit	0 feet	40 feet	40 feet

In addition, because wetland data were combined from various sources and multiple classification systems, wetlands in the database could contain multiple wetland classes in a single wetland complex. Most discrete wetland classes were either USFWS classes (e.g., PFO, PSS, PEM, or POW) or were the result of wetland boundary data for a specific wetland not exactly matching in shape, size, or exact location (e.g., King County vs. NWI vs. WDFW). Each discrete wetland was given a unique identification code and, if connected to other discrete wetlands, the group of wetlands was given a wetland complex identification code. Unique identification codes for discrete wetlands allow more detailed analysis of impacts to the various wetland types, especially Cowardin classes (Cowardin et al., 1979), but may overstate the total number of impacted wetlands. Complex codes better represent the actual number of wetlands affected than the unique codes, but do not allow for detailed wetland analysis or tracking of impacts.

The wetlands analyses in this section are based on the *I-405 Corridor Program Draft Wetlands Expertise Report* (DEA, 2001), herein incorporated by reference.

3.6.2.1 Analysis Approach

Five approaches were used to analyze wetland impacts: 1) sorting wetland data by High Priority (HP) and Lower Priority (LP) wetlands, 2) sorting available NWI wetlands data, 3) determining buffer impacts, 4) sorting data by jurisdiction, and 5) sorting data by basin.

High and Lower Priority Wetlands. To effectively analyze wetland impacts, a unique system of classifying wetlands was created by WSDOT (DEA 2002). The system attempts to differentiate wetlands of higher biological and hydrological value from those of lower value. Most jurisdictions along the I-405 corridor classify higher-value wetlands as Category 1 or 2. Ecology classifies them as Categories I through III. Because no uniform classification system exists for all wetlands in the corridor, a "priority" ranking system was used. Wetlands were designated as either High Priority (HP) or Lower Priority (LP). HP wetlands include all wetlands in the highest category defined by any jurisdiction or agency and the additional criteria listed in Table 3.6-2. High Priority wetlands are those wetlands:

Table 3.6-2:
High Priority Wetland Criteria by Jurisdiction

	ECOLOGY	KING COUNTY	SNOHOMISH COUNTY	REDMOND	TUKWILA	RENTON	BOTHELL	KENMORE	KENT	WOODINVILLE	KIRKLAND	NEWCASTLE	BELLEVUE
HIGHEST CLASSIFICATION CRITERIA BY JURISDICTION													
Type A - All wetlands related by surface hydrology to a Type A or B riparian corridor.													✍
Presence of T&E species	✍	✍		✍	✍	✍	✍	✍	✍	✍	✍	✍	
Critical or outstanding T&E habitat		✍		✍	✍	✍	✍	✍	✍	✍	✍	✍	
Priority or Sensitive Species present				✍			✍		✍				
WA Natural Heritage Program high quality native wetland	✍								✍			✍	
DNR Heritage Quality Wetland													
Bogs or fens	✍		✍									✍	
Estuarine wetlands or mature forested wetlands	✍		✍									✍	
Plant associations of infrequent occurrence		✍		✍		✍	✍	✍		✍			
No non-native plant populations	✍												
Regionally significant waterfowl or shorebird concentration area			✍										
Locally significant ('exceptional significance' or 'unique & fragile')	✍											✍	
40%-60% open water in dispersed patches w/ = 2 wetland veg. classes		✍		✍	✍	✍	✍	✍	a ✍	✍			
= 10 acres w/ = 3 wetland veg. classes (one of which can be open water)		✍	✍			✍	✍	✍	✍	✍	✍		
= 5 acres w/ = 3 wetland veg. classes					✍								
= 3 wetland classes each over 10% of total area			✍										
= 2 wetland classes		✍						✍					
No sig. human-caused degradation	✍												
= 1/4 acre of organic soils (peat or mucky soils)											✍		
Unique/outstanding #1 rating in King Co. Wetlands Inventory						b ✍				c ✍			
Hydrologically connected			✍										
Contiguous w/ Lake Washington											✍		
ADDITIONAL CRITERIA USED IN THIS ANALYSIS REGARDLESS OF JURISDICTION													
T&E species within habitat polygons (indicated on PHS and Streamnet databases)													
Any wetland located within 0.5 mile of T&E species point													
Any wetland in close proximity to streams with T&E or candidate species													
All wetlands 1 acre or more													

Note: Mountlake Terrace has no categorization criteria but uses SEPA process.

[a] (slight language difference than other citation: = 2 acres having 40% - 60% and = 2 veg. classes.)

[b] based on 1991 ("or most current") inventory

[c] based on 1983 inventory

- Identified by any jurisdiction in the study area as Category 1 or similar rating of the highest value. For example, any wetland in Redmond classified as Category 1 by the City of Redmond is considered HP;
- Containing threatened or endangered species within WDFW – PHS mapped areas (polygons); located within 0.5 mile of a documented threatened and endangered (T&E) species occurrence; or adjacent to streams with T&E or candidate species; or
- Greater than 1 acre in size.

Lower Priority wetlands are those wetlands not rated as HP. Because these wetlands potentially have lower values, protection and mitigation requirements may be less stringent than those for HP wetlands. They may, however, still provide important functions and be subject to permitting and other regulations. In particular, wetlands regulated under Section 404 of the Clean Water Act are subject to the USACOE permitting process. HP and LP wetlands would likely be subject to Section 404.

Because the criteria for rating the wetlands are broad, many wetlands classified at lower levels by local jurisdictions may have been considered HP in this analysis. This HP/LP classification system ensures that all high quality wetlands, including both those designated by agencies and jurisdictions and those that may not meet local criteria but still are of high value, are given HP status.

National Wetlands Inventory (NWI). Wetlands were also analyzed using the USFWS wetland classification system (Cowardin et al., 1979) if existing information was available. Analyzing wetland impacts by the USFWS classification system (Cowardin et al., 1979) provides insight into potential loss of wetland function as it relates primarily to wildlife utilization. Wetlands found along the various alternatives included three of the five classes of NWI wetlands, including Lacustrine, Palustrine, and Riverine systems. The Lacustrine (lake) System is composed of the Limnetic (L1) and Littoral (L2) subsystems. The Palustrine System includes non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent.

Palustrine wetlands include one or more of the following classes: forested (PFO), scrub-shrub (PSS), emergent (PEM), and open water (POW). The Riverine System includes wetlands contained within a channel that has been created either naturally or artificially and that usually, but not always, contains flowing water. The Riverine System is divided into four primary subsystems, tidal (R1), lower perennial (R2), upper perennial (R3), and intermittent (R4). These systems contain numerous subsystems, classes, subclasses, and modifiers to further describe the characteristics of a specific wetland.

Wetland Buffer. Wetland buffer impacts were analyzed using the same "impact width" assumptions as outlined in Table 3.6-1 above. Each wetland was assigned either a 100- or 50-foot buffer depending upon assigned priority (HP or LP, respectively). Buffers were considered impacted if any part of the impact width associated with a proposed improvement intersected the assumed buffer assigned to each wetland. Because buffer functionality varies substantially, buffer functions are discussed generally in this EIS. For the purposes of this programmatic assessment, buffer impacts are assumed to be highly correlated with total wetland acreage potentially impacted. Buffer functions and impacts will be analyzed at the project level during future NEPA and SEPA environmental analysis, documentation, and review.

Wetland Functions. Wetlands are known to perform important functions in an ecosystem, some of which are of immediate value to human society. Although these functions are complex, interrelated, and difficult to assess and quantify, guidelines for assessment have been developed by numerous agencies and jurisdictions, including USFWS, Ecology, WDFW, etc. While wetland functions may be considered in defining wetland classification criteria, they are not themselves criteria. Each wetland rating system has its own functional implications. Most of these functions have been included in WSDOT's *Wetland Functions Characterization Tool for Linear Projects*, which is summarized in Table 3.6-3 (Null et al., 2000). Valuable functions include: flood flow alteration; sediment removal; nutrient and toxicant removal; production of organic matter and its export; wildlife habitat; and fish habitat. The attributes that potentially influence wetland functions and are used as rating criteria are also provided in Table 3.6-3.

Table 3.6-3: Summary of Wetland Functions and Rating Criteria

Wetland Function	Attributes Used to Rate Function
Flood Flow Alteration	• Wetland size • Capacity • Location in the watershed (wetlands higher in the watershed have more effect on reducing flooding to downstream areas, while wetlands lower in the watershed may provide greater benefits to a specific area) • Situated within a riparian zone in a floodplain • Contains dense woody vegetation
Sediment Removal	• Configuration (wetland bowl shaped so that water is detained for long durations) • Contains dense herbaceous vegetation
Nutrient and Toxicant Removal	• Configuration (wetland bowl shaped so that water is detained for long durations) • Contains dense herbaceous vegetation
Erosion Control and Shoreline Stabilization	• Part of a watercourse • Vegetation composed of either a dense energy-absorbing, resilient herbaceous layer or a mixture of trees and large multi-stemmed shrubs that can withstand high flow velocities and/or wave action
Production of Organic Matter and its Export	• Large areas of vegetation • Structural complexity (plant layers) • Contains a surface water outlet
Wildlife Habitat	• Possesses two or more USFWS classification systems • Possesses connectivity • Signs of wildlife use present • Contains plant forage species
Fish Habitat	• Associated with fish-bearing waters • Possesses acceptable water quality • Contains appropriate conditions for rearing, refuge, and/or spawning habitat

3.6.3 Affected Environment

A total of 2,395 existing discrete wetlands (1,066 complexes) are located within 19 basins (26 sub-basins) in the study area. Furthermore, approximately 9,814 acres of wetland occur in the study area based on the existing data. Table 3.6-4 depicts the total number of documented discrete and complex wetlands per sub-basin, and the total wetland acreage of each basin in the study area. Basins within the study area with over 100 documented wetland complexes include the Black River (n = 184), North Creek (n = 112), and the Sammamish River (n = 117). Wetlands in the study area appear to be most common in the Kent Valley, the Sammamish Valley of Redmond, in Bellevue at I-405 and I-90, and the North Creek area of Woodinville and Bothell. Major NWI Lacustrine

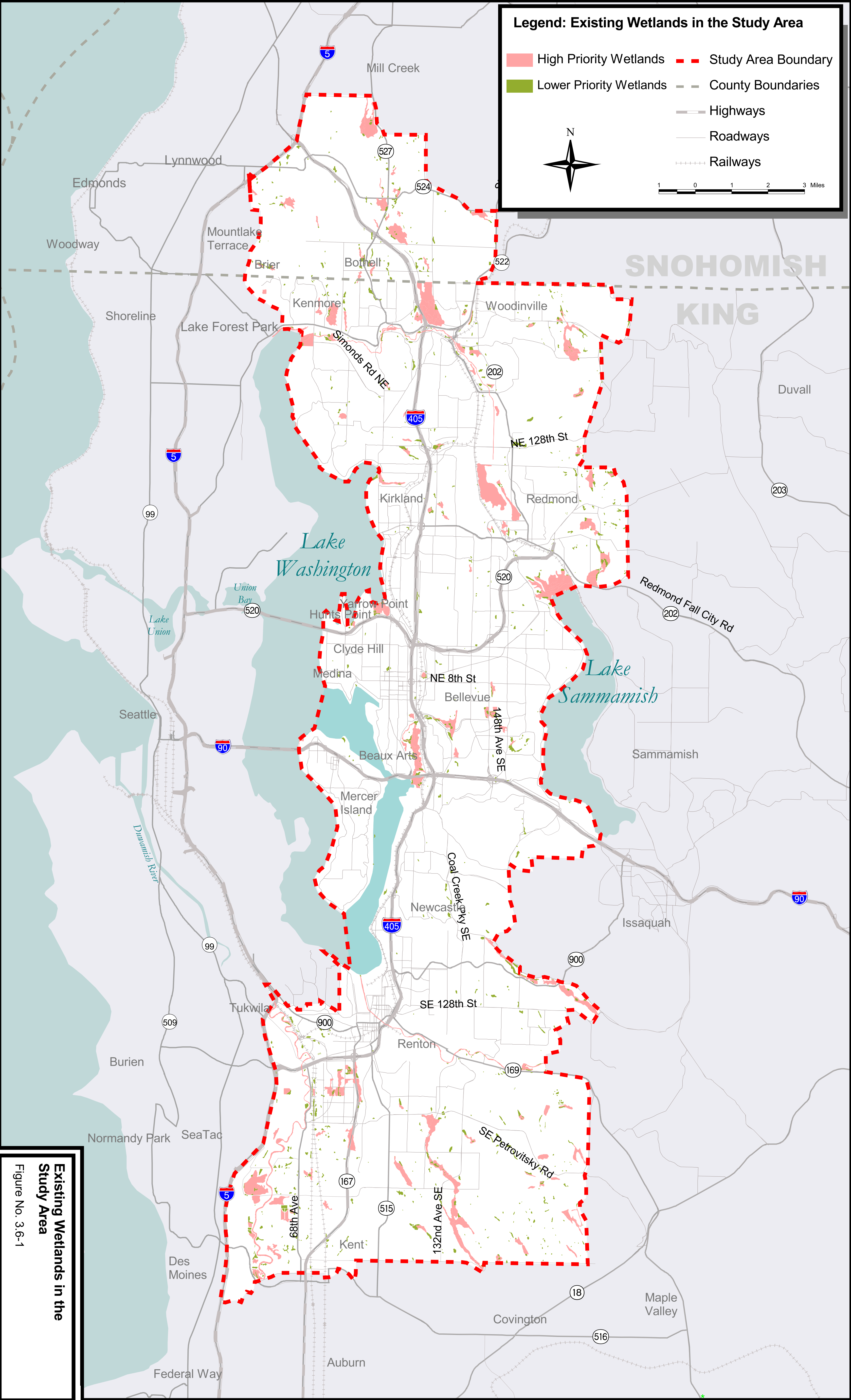
System wetlands in the study area include Lake Washington and Lake Sammamish. Figures 3.6-1 and 3.8-1 (in Section 3.8) generally present the wetlands and basins within the study area.

Table 3.6-4: Summary of Wetland Quantity and Acreage by Sub-Basin within the Study Area.

Basin	Number of Unique IDs	Number of Complexes	Total Area (Acres)
Cedar/Sammamish/ Lake Washington Watershed (WRIA 8)			
Swamp Creek	131	56	494
Big Bear Creek	228	88	744
Lower Cedar River	171	87	622
Coal Creek (Cedar)	7	6	7
West Lake Sammamish	63	38	188
East Lake Sammamish	6	1	6
East Lake Washington	105	80	256
Evans Creek	51	16	252
Forbes Creek	32	14	85
Issaquah Creek	5	1	55
Juanita Creek	51	24	131
Kelsey Creek	55	28	202
Little Bear Creek	50	21	172
Jenkins Creek	31	22	124
Sammamish River	320	117	1,629
Lyon Creek	12	7	20
May Creek	122	26	361
Mercer Island	16	12	289
Mercer Slough	79	17	426
West Lake Washington	1	1	< 0.5
North Lake Washington	11	6	21
North Creek	257	112	1,213
Green/Duwamish Watershed (WRIA 9)			
Lower Green River	77	23	536
Duwamish River	11	5	51
Soos Creek	180	74	815
Black River	323	184	1,116
Total Wetlands	2,395	1,066	9,814

Describing the numbers and acreage of wetlands by basin within the study area provides insight into baseline conditions within hydrologic boundaries. The study area does not follow hydrologic boundaries and includes the lower portion of many of the basins outlined in Table 3.6-4 above. Furthermore, some basins outlined in Table 3.6-4 extend beyond the study area or are not impacted by project-specific activities associated with the various alternatives.

The wetlands in the study area provide a number of functions and values in the biological, hydrological, and societal landscape. For example, these wetlands provide essential habitat for threatened and endangered (T&E) plants and animals, and for species with other special status. HP wetland functions include:



Existing Wetlands in the Study Area

Figure No. 3.6-1

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- Providing perching, foraging, and/or buffer habitat for wildlife species with state or USFWS T&E species status, and specifically bald eagle and Oregon spotted frog (*Rana pretiosa*), although it is extremely unlikely that the latter species is present in the study area.
- Providing habitat for state and USFWS Species of Concern and Priority Species, including wood duck (*Aix sponsa*), mink (*Mustela vison*), and western toad (*Bufo boreas*).
- Providing habitat buffers for fish species with state or federal status, including Puget Sound chinook salmon (*Oncorhynchus tshawytscha*), bull trout (*Salvelinus confluentus*), and Puget Sound/Strait of Georgia coho salmon (*Oncorhynchus kisutch*). (See *I-405 Corridor Program Draft Fish and Aquatic Habitat Expertise Report* [DEA, 2001b]).
- Providing breeding or foraging habitat for common wetland species such as Canada goose (*Branta canadensis*), pied-billed grebe (*Podikymbus podiceps*), American coot (*Fulica americana*), spotted sandpiper (*Actitis macularia*), belted kingfisher (*Ceryle alcyon*), marsh wren (*Cistothorus palustris*), common yellowthroat (*Geothlypis trichas*), red-winged blackbird (*Agelaius phoeniceus*), several dabbling duck species (*Anas* spp.), vagrant shrew (*Sorex vagrans*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), tree frog (*Hyla regilla*), and northwestern salamander (*Ambystoma macrodactylum*).
- Providing resting or feeding habitat for migrating birds, including waterfowl and shorebirds.
- Supporting T&E plant species such as water howellia (*Howellia aquatilis*), although no threatened or endangered plant species are known or likely to occur in the study area.
- Providing habitat for other native plant species.
- Removing sediment, nutrients, and contaminants from surface water.
- Reducing peak flows and storing flood waters.
- Recharging groundwater.

Functions that are expected to be present in LP wetlands within the study area include:

- Providing habitat for common wetlands-associated wildlife species.
- Reducing peak flows and storing flood waters.
- Removing sediment, nutrients, and contaminants.
- Recharging groundwater.

Analyzing HP wetlands, as well as total wetlands, is important because HP wetlands will need to be avoided as much as possible while LP wetlands may provide better opportunities for mitigation. LP wetlands are scattered throughout the study area. In general, HP wetlands in the study area are predominantly located near stream corridors in:

- Redmond (east of SR 202 and northwest of Lake Sammamish);
- Woodinville (east of I-405, north of SR 522);
- Bellevue (just west of I-405); and
- Kent (large, scattered wetlands east of I-5 to Kent Valley).

Wetland buffers are required in most jurisdictions within the study area. Buffers help maintain wetland functions and values by limiting many of the typical wetland alterations caused by construction projects. Existing wetland buffers within and adjacent to the right-of-way of the proposed improvements vary in vegetation composition and width. Effective buffers are typically composed of various species of native vegetation that can protect and enhance potential wetland functions. Buffers within the existing roadway prism are typically not effective in protecting many of the functions and values associated with wetlands. Because buffer effectiveness depends upon the nature of the buffer, the specific wetland function or value being protected, and the potential alteration, buffer effectiveness is difficult to quantify. Many of the wetland buffers adjacent to the existing highways, arterials, and railroad right-of-way are mowed or otherwise altered. Wetland buffers within the existing roadway prisms are not typically part of the estimate for buffer impacts. Much of the affected buffer acreage discussed in this report consists of lateral extensions of an existing, mowed road shoulder's toe-of-slope.

3.6.4 Impact Analysis

The ability to quantify impacts of the proposed transportation improvements on wetlands is limited at the programmatic level and therefore any impact must be considered "potential." This level of analysis is consistent with the level of design available and the objectives of a programmatic EIS. Some projects, such as park-and-ride lots, lack specific information. The potential wetland impacts associated with these projects were impossible to determine without specific locations and sizes, and were therefore not quantified. Because detailed design plans are not yet available, acreage impacts are estimates and, while they are useful for comparisons among alternatives, they cannot be accurately determined for each type of transportation improvement. The number of wetlands impacted is used for comparison purposes, since the extent of the impact could only be estimated. All potential wetland impacts presented below represent the reasonable worst-case scenario. Details of wetland resources potentially impacted by the individual projects are recorded in Appendix C of the *I-405 Corridor Program Draft Wetlands Expertise Report* (DEA, 2001a).

For the purposes of the following analysis, wetland impacts are discussed by alternative and by transportation element, sorted by the five approaches: HP/LP, NWI, buffers, basins, and jurisdictions. The following paragraphs present the findings of the impact analyses.

High and Lower Priority. Table 3.6-5 presents a summary of wetland impacts for all alternatives. Impacts for Alternatives 1 through 4 and the Preferred Alternative include the baseline conditions associated with the No Action Alternative. The numbers of wetlands impacted include the number of discrete wetlands followed by the number of wetland complexes in parentheses. Between 35 and 190 discrete wetlands (25 and 110 complexes, respectively) could be impacted by the proposed improvements. These potential impacts are associated with 3 to 56 acres of wetlands. Impacts to HP wetlands range from 16 to 89 acres of unique wetlands.

The values reported in the following tables do not recognize the existing footprint of the BNSF Railroad where portions of the proposed fixed-guideway HCT facility would be aligned (Alternatives 1 and 2 only). This set of values provides a conservative estimate of wetland impacts. It is also a reasonable assumption for a substantial portion of the fixed-guideway HCT alignment that is proposed from Factoria to Issaquah and from Bellevue to Redmond, where no BNSF right-of-way exists. If the existing footprint for the BNSF Railroad had been incorporated into the calculations, the number of wetlands reported for Alternatives 1 and 2 would be less. Alternative 1 would impact 107 discrete wetlands (58 high priority) and 63 wetland complexes

(23 high priority), totaling approximately 14.6 acres (8.5 acres high priority). Alternative 2 would impact 171 discrete wetlands (75 high priority) and 97 wetland complexes (31 high priority), totaling approximately 41.9 acres (19.8 acres high priority).

Table 3.6-5: Summary of Wetland Impacts

	No Action	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Preferred Alternative
Acres of Wetland Area Impacted	3.3	28.9	56.2	39.6	39.0	24.9
Number of Discrete Wetlands Impacted (number of complexes)	35 (25)	126 (76)	190 (110)	170 (96)	152 (96)	150 (85)
Number of High Priority, Discrete Wetlands Impacted (number of complexes)	16 (9)	72 (30)	89 (38)	78 (34)	64 (36)	79 (36)
Acres of HP Wetlands Impacted	1.8	22.2	33.5	19.0	18.5	13.2
Acres of New Impervious Surface Area	173	478	820	773	1061	974

National Wetlands Inventory. USFWS (NWI) wetland classifications were available for only a portion of the potentially impacted wetlands in the existing database. The percentage of wetland impacts that could not be assigned to a specific USFWS classification varied by alternative, ranging from 24 percent (Alternative 1) to 48 percent (No Action Alternative). Wetlands with multiple USFWS classifications that could not be assigned to a specific class also varied by alternative, but ranged from 0 percent (No Action Alternative) to 20 percent (Preferred Alternative). Table 3.6-6 below depicts the acreage of various USFWS wetland classification types impacted by each alternative.

Table 3.6-6: Acres of Wetland Impacts by USFWS Classification

USFWS Classification	No Action	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Preferred Alternative
Lacustrine (L1UBH)	0.0	0.2	0.2	0.0	0.0	0.0
Emergent (PEM)	0.6	9.0	15.6	8.9	8.5	3.5
Scrub-Shrub (PSS)	0.6	6.0	9.8	4.7	4.7	4.9
Forested (PFO)	0.3	1.8	5.4	4.5	4.0	1.0
PUBH & PABH	0.0	0.5	0.6	0.0	0.1	0.1
Riverine (R2 - 4)	0.3	2.8	3.6	2.4	2.2	2.5
Multiple USFWS Classes	0.0	1.9	5.1	4.8	5.1	5.0
Unknown USFWS Class (percent unknown)	1.6 (48)	6.9 (24)	16.0 (29)	14.2 (36)	14.5 (39)	8.1 (39)
Total Impact[a]	3.3	28.9	56.2	39.6	39.0	24.9

[a] Totals may vary due to rounding

Buffers. Impacts to wetlands also occur when buffers are reduced. These buffer impacts can reduce wetland quality and their functionality. Table 3.6-7 lists potential wetland buffer impacts in the study area. Buffer impacts of the alternatives range from 10 to 121 acres.

Table 3.6-7: Acres of Wetland Buffer Impacts by Basin within the Study Area.

Basin	No Action	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Preferred Alternative
Big Bear Creek	0.0	0.6	0.6	< 0.5	0.0	0.0
Black River	1.7	4.9	38.2	37.2	36.2	13.6
Duwamish River	0.0	0.0	< 0.5	< 0.5	< 0.5	< 0.5
East Lake Washington	0.0	4.4	4.7	1.5	1.6	2.0
Evans Creek	0.3	0.3	0.3	0.3	0.3	0.3
Forbes Creek	0.0	< 0.5	0.2	0.2	0.2	0.2
Juanita Creek	0.3	3.0	3.0	1.3	1.3	1.3
Kelsey Creek	0.0	0.5	0.5	0.0	0.0	0.0
Little Bear Creek	0.0	0.0	2.1	2.1	2.1	2.1
Lower Cedar River	0.3	2.6	2.8	3.0	2.4	3.0
Lower Green River	0.0	1.0	1.5	0.9	1.3	1.2
May Creek	0.0	1.8	2.2	2.2	2.2	2.2
Mercer Slough	0.0	8.8	8.8	0.1	0.2	0.1
North Creek	2.0	32.5	36.2	18.4	19.4	18.5
Sammamish River	4.8	8.0	12.9	11.7	12.9	12.6
Soos Creek	0.0	0.9	0.9	0.9	0.0	0.9
Swamp Creek	1.2	4.6	6.2	2.8	3.1	2.8
Approximate total[a]	10.7	74.0	121.2	82.7	83.4	60.9

[a] Totals may vary due to rounding

Basin. Table 3.6-8 below depicts the total numbers of wetlands impacted per basin. The number of discrete wetlands is followed by the total acreage of associated wetland impacts in parentheses. Table 3.6-8 includes only the 14 basins with potential wetland impacts, and is therefore a subset of the 26 sub-basins outlined in Table 3.6-4.

Table 3.6-8: Summary of Wetland Impacts by Basin – Number of Wetlands (Acreage)

Basin	No Action	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Preferred Alternative
Big Bear Creek	0 (0)	2 (0.7)	3 (0.8)	2 (0.3)	2 (0.2)	2 (0.3)
Black River	10 (1.4)	26 (3.2)	63 (25.1)	62 (24.5)	49 (23.5)	40 (9.3)
East Lake Washington	0 (0)	3 (0.3)	3 (0.3)	1 (< 0.5)	2 (0.3)	2 (0.3)
Juanita Creek	2 (< 0.5)	3 (0.2)	4 (0.2)	4 (0.2)	4 (0.2)	4 (0.2)
Kelsey Creek	0 (0)	1 (0.1)	1 (0.1)	0 (0)	0 (0)	0 (0)
Little Bear Creek	0 (0)	0 (0)	4 (1.6)	5 (1.7)	5 (1.7)	5 (1.7)
Lower Cedar River	1 (0.1)	5 (0.9)	6 (1.0)	7 (1.1)	5 (0.9)	7 (1.1)
Lower Green River	0 (0)	1 (0.4)	2 (0.6)	2 (0.4)	2 (0.4)	2 (0.3)
May Creek	0 (0)	0 (0)	3 (0.4)	3 (0.4)	3 (0.4)	3 (0.4)
Mercer Slough	0 (0)	11 (3.5)	11 (3.5)	1 (< 0.5)	2 (0.1)	1 (< 0.5)
North Creek	7 (0.6)	44 (16.2)	49 (17.0)	43 (6.4)	40 (6.7)	43 (6.4)
Sammamish River	12 (0.8)	21 (1.6)	30 (3.3)	30 (3.1)	30 (3.4)	31 (3.3)
Soos Creek	0 (0)	3 (0.2)	3 (0.2)	3 (0.2)	0 (0)	3 (0.2)
Swamp Creek	3 (0.5)	6 (1.7)	8 (2.1)	7 (1.4)	8 (1.4)	7 (1.4)
Total Impact[a]	35 (3.3)	126 (28.9)	190 (56.2)	170 (39.6)	152 (39.0)	150 (24.9)

[a] Totals may vary due to rounding

Jurisdiction. Potentially impacted wetlands were also analyzed by jurisdiction. All wetlands documented within each jurisdictional boundary are included in Table 3.6-9. This analysis includes the number of discrete wetlands impacted based on unique identification codes and number of acres impacted. All totals depicted in Table 3.6-9 include the No Action Alternative. Furthermore, alternative totals do not directly match summarized totals above since some wetlands are bisected by jurisdictional boundaries and are thus counted twice. Jurisdictions with the greatest impacts to wetlands are Bothell and Renton.

Table 3.6-9: Summary of Wetland Impacts by Jurisdiction – Number of Wetlands (Acreage)

Jurisdiction	No Action	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Preferred Alternative
Bellevue	0 (0.0)	12 (3.6)	12 (3.6)	1 (< 0.5)	3 (0.4)	2 (0.3)
Bothell	3 (0.2)	41 (15.4)	48 (17.4)	43 (7.1)	42 (7.6)	46 (7.5)
Kenmore	0 (0.0)	2 (0.2)	2 (0.2)	2 (0.2)	2 (0.2)	0 (0.0)
Kent	0 (0.0)	0 (0.0)	22 (14.8)	22 (14.8)	22 (14.8)	0 (0.0)
King County	4 (0.2)	7 (0.5)	11 (1.3)	13 (1.4)	10 (1.2)	13 (1.4)
Kirkland	1 (< 0.5)	3 (0.2)	4 (0.2)	3 (< 0.5)	3 (< 0.5)	3 (< 0.5)
Newcastle	0 (0.0)	0 (0.0)	3 (0.4)	3 (0.4)	3 (0.4)	3 (0.4)
Redmond	11 (0.7)	16 (1.5)	16 (1.6)	15 (1.1)	12 (0.8)	15 (1.1)
Renton	10 (1.4)	29 (3.6)	48 (10.9)	48 (10.5)	34 (9.3)	44 (10.1)
Snohomish County	8 (0.9)	12 (2.8)	15 (2.8)	13 (1.9)	15 (2.1)	13 (1.9)
Tukwila	0 (0.0)	2 (0.9)	3 (1.1)	2 (0.3)	2 (0.4)	2 (0.4)
Woodinville	0 (0.0)	1 (0.2)	7 (1.9)	8 (1.7)	8 (1.7)	8 (1.7)
Total Impact[b]	37[a] (3.3)	125[a] (28.9)	191[a] (56.2)	173[a] (39.6)	156[a] (39.0)	149[a] (24.9)

a Total numbers of wetlands impacted (not acres) vary slightly from previous tables because some wetlands fall within two jurisdictions and were therefore counted twice.

b Totals may vary due to rounding.

3.6.4.1 No Action Alternative

The No Action Alternative would potentially result in impacts to 25 wetland complexes, including 9 HP wetland complexes, totaling approximately 3 acres of direct impact and 10 acres of buffer impacts. Most of the improvements near wetlands occur in the cities of Redmond, Woodinville, and Renton. Most impacts to wetlands and their buffers would occur in the Black River, North Creek, and Sammamish River basins. Most of the wetlands did not have NWI classifications (48 percent), and therefore, a discussion of these wetland's classifications could not be provided. The No Action Alternative will result in the lowest number and area of impacts to wetlands and wetland buffers in the study area.

Table 3.6-10 indicates the numbers and acres of wetlands impacted by each type of transportation improvement in the No Action Alternative. Some types of improvements overlap due to multiple impacts to the same wetland system. Committed arterial projects would impact the greatest number of wetlands of any improvement – 23 discrete wetlands, 13 of which are HP (14 wetland complexes, 6 of which are HP).

Table 3.6-10: No Action Alternative Impacts

Type of Improvements	Potential Impacts to Wetland Complexes	Potential Impacts to HP Wetlands	Acres of Wetlands Impacts
Arterial Capacity	1	0	0.4
Arterial Capacity/Committed Arterial	6	3	0.5
Arterial HOV	3	0	0.3
Committed Arterial	14	6	2.1
HOV Ramps	1	0	< 0.5
No Action Total Impacts	25	9	3.3[a]

[a] Totals may vary due to rounding

Construction Impacts

Construction associated with the No Action Alternative would potentially have direct, short-term impacts on approximately 3 acres of wetlands. About 2 acres are associated with the arterial committed projects. Some of these impacts may be avoidable or minimized through engineering design refinements. Habitat fragmentation is a potential direct impact from construction; however, because no new roads are proposed in this alternative, the potential for this alternative to fragment wetland habitat is low. Buffer impacts could indirectly impact additional wetlands and species of wildlife that depend on them, especially in the North Creek Basin.

Short-term impacts due to sedimentation, contamination, and the presence of construction crews and machinery are possible. Increases in human activity and construction can disturb wildlife and alter nesting and breeding behaviors. Short-term increases in sediment and/or pollutant loads may occur during construction, and this may temporarily lessen a wetland's ability to filter sediment and contaminants. Sediment increases are often due to changes in runoff patterns associated with disturbed ground. Project design would incorporate storm drainage features to ensure that contaminants and sediments are controlled. (See *I-405 Corridor Program Draft Surface Water Resources Expertise Report* [CH2M HILL, 2001a]).

Operational Impacts

Permanent increases in impervious surface would likely lead to some degradation of wetlands from associated increases in sediment and contaminant loads from runoff. Because the No Action Alternative includes a 173-acre increase in impervious surface, some impacts are possible. However, this alternative results in the lowest increase in impervious surface of all the alternatives. Potential operational impacts of the proposed projects include increased noise and vehicular traffic, sedimentation, contamination, and changes in runoff pulse and timing.

Project-level design would evaluate the potential for contaminants to be introduced into wetlands via road runoff, and projects would incorporate storm drainage features to ensure contaminants and sediments are controlled. Retrofitting of existing facilities could occur in conjunction with many of the projects. Pollutant loading and overall impacts to surface water from the improvements were presented in the *I-405 Corridor Program Draft Surface Water Resources Expertise Report* and were determined to be below the threshold of significance (CH2M HILL, 2001a).

Wetland hydrology may be altered through the placement of fill and the reduction of storage volume, through changes in permeable surface area, or through rerouting of "feeding" water. Project-level design would consider existing inundation and flooding patterns to ensure projects avoid altering wetland hydrology. Increases in impervious surface may alter groundwater hydrologic regimes within the study area. Project-level drainage design would provide comparable infiltration rates and volumes when appropriate and feasible.

Functional Evaluation. Because of their potential size, category, and/or association with T&E species, HP wetlands are assumed to provide more wetland function than a typical LP wetland. With extreme variability in function of an individual wetland, only HP and riverine systems warranted independent discussion of function. It is assumed that all wetlands provide valuable function.

No wetlands would be impacted by the No Action Alternative within the Big Bear Creek, East Lake Washington, Kelsey Creek, Little Bear Creek, Lower Green River, May Creek, Mercer Slough, and Soos Creek basins. Therefore, no impacts to wetland functions within these basins, would result from the No Action Alternative. A relatively small portion of the overall wetland acreage would be impacted within the North Creek, Black River, Juanita Creek, Lower Cedar River, North Creek, Sammamish River, and Swamp Creek basins. Small areas of potential impacted wetlands within the North Creek, Black River, Lower Cedar River, and Sammamish River basins are considered high priority. A small portion of impacted wetlands within the Sammamish River Basin is designated USFWS Riverine wetlands. Project-level design aimed at minimizing impacts, retention and detention of stormwater implemented at the project level, and retrofitting of existing facilities would help minimize impacts to functions within wetlands.

3.6.4.2 Alternative 1: HCT/TDM Emphasis

Alternative 1 includes a new fixed-guideway HCT system that would follow part of the existing Burlington Northern Santa Fe Railway (BNSF) system. However, in places it does deviate from the existing BNSF tracks and would parallel and cross numerous roads in the study area. Alternative 1 also includes substantial expansion of local bus transit service, non-construction mobility solutions such as regional transportation pricing, and transportation demand management strategies. Arterial HOV priority, additional park-and-ride capacity and transit center improvements, and all actions associated with the No Action Alternative are included in Alternative 1. Section 2.2.2 contains a complete description of improvements associated with Alternative 1, and Figure 2.2-2 depicts the location of improvements associated with Alternative 1.

Alternative 1 would potentially impact 76 wetland complexes, including 30 HP wetland complexes (Table 3.6-5). Total wetland area filled under this alternative would be approximately 29 acres. This is the lowest number and acreage of wetlands and the lowest number of HP wetlands of the action alternatives. However, the total acres of impact to HP wetlands are higher than Alternatives 3, 4, or the Preferred Alternative. Wetland impacts associated with Alternative 1 are mostly to scrub-shrub wetlands, emergent wetlands, and unknown NWI Classes (Table 3.6-6). Although minor, impacts to lacustrine wetlands are a result of the close proximity of the BNSF railway to Lake Washington at Kennydale. Direct impacts to Lake Washington are not likely, but were included due to its shoreline being within 40 feet of the existing railway centerline at that point. By far, the greatest impact to buffer acreage is in the North Creek Basin. The cities of Renton and Bothell have the highest number of discrete wetlands impacted of the jurisdictions in the study area.

Table 3.6-11 indicates the wetland impacts of each type of improvement. The wetland impacts by the HCT under this alternative represent a worst-case scenario, in which the HCT is aligned at the surface (not elevated). This transportation element has high potential for impacting wetlands in the study area, but also the highest degree of design flexibility as the HCT can be designed to bridge sensitive areas, or realigned to avoid wetlands. In actuality, wetland impacts from HCT under this alternative could be much lower than those shown in Table 3.6-11.

The total number of impacts to wetlands presented in Table 3.6-11 is higher than in previous tables because multiple types of improvements caused multiple counts. Totals at the bottom of Table 3.6-11 present the total number of times wetlands are impacted and not the total number of wetlands impacted.

Table 3.6-11: Alternative 1 Impacts

Type of Improvements	Potential Impacts to Wetland Complexes	Potential Impacts to HP Wetlands	Acres
Arterial Capacity	3	1	0.5
Arterial HOV	18	9	3.4
Basic Improvements	21	8	3.4
Committed Arterial	18	8	2.3
Fixed-Guideway HCT [a]	29	9	17.4
HOV Ramps	1	0	< 0.5
I-405 Crossings & Ped/Bicycle	14	10	1.9
Alt. 1 Total Impacts [b]	104	45	28.9

[a] Impacts for HCT are based on a system aligned at the surface and represent realistic worst-case scenarios.
[b] Totals include wetlands impacted by more than one type of improvement and are higher than totals in summary tables

The HCT system would serve the major activity centers within the study area including Redmond, Issaquah, Renton, Bellevue, and across Lake Washington to Seattle. Impacts associated with the Lake Washington to Seattle crossing are addressed in the Trans-Lake Washington Project EIS.

Construction Impacts

Direct, short-term construction impacts associated with Alternative 1 include 28.9 acres of potential wetland impacts. These impacts include the 3.3 acres impacted under the No Action Alternative. Approximately 17 acres of the wetland impacts are associated with the HCT project. Some of these impacts may be avoidable or minimized through engineering design refinements. Design refinements that might be employed include bridging and retaining walls, temporary fencing to restrict the intrusion of construction equipment into wetlands, work area buffers, check dams, temporary seeding, mulching, jute netting, phased construction, and construction during less sensitive seasons. All appropriate avoidance and minimization strategies would be pursued during project-level design. Approximately 7 acres of fill could be avoided by realigning or elevating the HCT. While some part of the HCT system proposed under this alternative may fragment wetlands, much of the new construction presents opportunities to avoid wetlands. The potential for this alternative to fragment wetland habitat is consequently low to moderate. Avoidance opportunities can be examined in detail at the project level. The amount of construction required for this alternative, while greater than that required for the No Action Alternative, is considerably less than for the other action alternatives.

Operational Impacts

Alternative 1 would potentially result in greater operational impacts than the No Action Alternative. Four hundred and seventy-eight acres of increased impervious surface are associated with this alternative. The 478 acres of new impervious surface includes 173 acres associated with the No Action Alternative (see Table 3.6-5). The increased stormwater and associated contaminants would require the same treatment and management as the other alternatives relative to the amount of new impervious surface. Project-level design aimed at minimizing impacts, retention and detention of stormwater implemented at the project level, and retrofitting of existing facilities would help minimize impacts to functions within wetlands. Further discussion of the potential impacts to water resources may be found in the *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001a) and the *I-405 Corridor Program Draft Groundwater Resources Expertise Report* (CH2M HILL, 2001b).

Functional Evaluation. Impacts resulting from Alternative 1 would result in greater functional impacts than the No Action Alternative. Although scrub-shrub and emergent wetlands are the most impacted, 24 percent of the wetlands are not NWI unclassified and therefore a complete assessment is not possible at this time. More than 77 percent of the wetlands are HP, indicating that higher functions may be lost, most likely in North Creek, Black River, and Sammamish River basins where the majority of the acreage is impacted.

3.6.4.3 Alternative 2: Mixed Mode with HCT/Transit Emphasis

Alternative 2 includes the fixed-guideway HCT system, widening of I-405 and SR 167, basic improvements to I-405 and core TDM strategies (similar to all alternatives), and new capacity improvements on connecting arterials and freeways as defined in Appendix B and depicted on Figure 2.2-3. Table 3.6-12 indicates the wetlands impacted by improvement types. Again, as described above, the number of wetlands impacted by the HCT under this alternative represents a reasonable worst-case scenario, in which HCT is aligned at the surface. Impacts from HCT under this alternative could be much lower than those shown in Table 3.6-12.

Alternative 2 would result in the greatest impact to wetlands in the study area. Approximately 110 wetland complexes, including 38 HP wetland complexes would be impacted under this alternative. This alternative could impact approximately 56 acres of wetlands in the study area, compared with approximately 25 to 39 acres under the other action alternatives (see Table 3.6-5). Furthermore, Alternative 2 could result in impacts to more than 5 acres of forested wetlands, more than any other alternative. North Creek, Black River, and Sammamish River basins would receive over 60 percent of the impacts. Bothell, Renton, and Kent are the jurisdictions with the most impacts to wetlands for this alternative.

Only a few road projects within this alternative have the potential to alter wetland buffers. Widening SR 167 from I-405 to the study boundary has the most potential to substantially alter wetlands/wetland buffers. New HCT alignments have the potential to alter wetland buffers. Although final alignment design could avoid many wetlands and wetland buffers, some impacts associated with riparian wetland crossings (e.g., the Green River or the Sammamish River) would likely be unavoidable. Overall, the highest percentage of wetland buffer impacts associated with Alternative 2 would occur within the Black River, North Creek, and Sammamish River basins (Table 3.6-7).

The total number of impacts presented in Table 3.6-12 is higher than in previous tables because multiple types of improvements caused multiple counts. Table 3.6-12 presents the total number of times wetlands are impacted and not the total number of wetlands impacted.

Table 3.6-12: Alternative 2 Impacts

Type of Improvements	Potential Impacts to Wetland Complexes	Potential Impacts to HP Wetlands	Acres of Impact
Arterial Capacity	4	2	0.8
Arterial HOV	17	9	3.0
Arterial Interchange	2	1	0.2
Basic Improvements	11	4	1.7
Committed Arterial	16	7	2.1
Connecting Freeway Capacity	14	4	3.7
General Purpose Lane	16	6	2.3
Fixed-Guideway HCT [a]	23	9	16.7
HOV Ramps	2	0	< 0.5
I-405 Crossings & Ped/Bicycle	13	9	1.9
Planned Arterial	8	5	1.8
Widening of SR 167	17	4	22.0
Alt. 2 Total Impacts[b]	143	60	56.2

[a] Impacts for HCT are based on a system aligned at the surface and represent realistic worst-case scenarios.
[b] Totals include wetlands impacted by more than one type of improvement and are higher than totals in summary tables.

Construction Impacts

Construction impacts would be similar to those for the other alternatives. Relative to Alternative 1, a higher number of projects are proposed in this alternative. This would result in more potential impacts during the construction period, including noise. However, wetlands along SR 167 typically abut the existing roadway, with emergent wetlands along the west side and multiple wetland types along the east side (PFO, PSS, PEM, and POW). Wetlands associated with Springbrook Creek and its tributaries cross and parallel SR 167 in the vicinity of the proposed project activities.

The potential for this alternative to fragment wetland habitat is consequently high in comparison to the other action alternatives. Many of the impacts associated with Alternative 2 are unavoidable, as they are expansions or additions to existing roads and realignment is not practical.

Operational Impacts

Operational impacts of this alternative are similar to the other alternatives. New road construction would affect over 50 wetland complexes out of a total of 110 complexes impacted by the alternative. Impervious surface area nearly doubles with this alternative compared to Alternative 1. A subsequent increase in the effects of runoff, sedimentation, and contamination, and corresponding impacts to wetlands, would be expected. Project-level design aimed at minimizing impacts, retention and detention of stormwater implemented at the project level, and retrofitting of existing facilities would help minimize impacts to functions within wetlands.

Functional Evaluation. Nearly 60 percent of the acreage impacted is HP wetlands, occurring mostly in the Black River Basin and some in North Creek Basin. Within the Black River Basin, approximately 25 acres of impacts to wetlands and 38 acres to buffers would occur as a result of the Alternative 2 improvements. This amount of wetland impact to the Black River Basin is greater than any other basin and any other alternative. Of the wetlands impacted, approximately 11 acres are considered HP wetlands. None of the wetlands within the Black River Basin are designated Riverine by the USFWS classification system. Because of the higher area of impact to wetlands within the Black River Basin, functional impacts to wetlands would tend to be high.

3.6.4.4 Alternative 3: Mixed Mode Emphasis

Alternative 3 includes implementing a new bus rapid transit (BRT) system, expanding local bus transit service, adding two lanes in each direction on I-405, and improving arterials within the study area. The BRT system would include improved-access HOV lanes on I-405, I-90, and SR 520 with routes to several major activity centers in the study area. Section 2.2.4 contains a detailed account of all the improvements associated with Alternative 3, while project locations are depicted on Figure 2.2-4.

Alternative 3 could impact approximately 96 wetland complexes composed of 34 HP wetland complexes. Total wetland area filled under this alternative would be approximately 39 acres of wetland complexes, including 19 acres of HP wetlands. Furthermore, approximately 83 acres of wetland buffer impacts, mostly in the Black River Basin, are associated with this alternative. Impacts associated with Alternative 3 are typically greater than Alternative 4 and the Preferred Alternative, but less than Alternative 2 (Table 3.6-5). However, the number of acres impacted, number of complexes impacted, and number of HP acres impacted is very similar to Alternative 4. The total acres of new impervious surface associated with this alternative are less than Alternatives 2 and 4 and the Preferred Alternative, but greater than both the No Action Alternative and Alternative 1. Table 3.6-13 presents the wetland impacts for alternative improvements. Wetland impacts from this alternative are mostly to scrub-shrub, forested, and emergent wetlands. Basins with the highest degree of wetland impacts include the Black River and North Creek. Similar to Alternative 2, the cities of Renton, Bothell, and Kent have the highest number and acres of unique wetlands impacted under this alternative.

The total number of impacts to wetlands presented in Table 3.6-13 is higher than previous tables because multiple types of improvements caused multiple counts. Totals on Table 3.6-13 represent the total number of times wetlands are impacted and not the total number of wetlands impacted.

Table 3.6-13: Alternative 3 Impacts

Type of Improvements	Number of Potential Impacts to Wetland Complexes	Number of Potential Impacts to HP Wetlands	Acres of Impact
Arterial Capacity	8	4	1.1
Arterial HOV	21	9	3.6
Arterial Interchange	2	1	0.2
Committed Arterial	18	8	2.3
Connecting Freeway Capacity	11	2	3.1
General Purpose Lane	20	6	3.6
HOV Ramps	2	0	0.0
I-405 Crossings & Ped/Bicycle	13	10	1.9
Planned Arterial	8	4	1.8
Widening of SR 167	18	4	22.0
Alt. 3 Total Impacts [a]	121	48	39.6

[a] Totals include wetlands impacted by more than one type of improvement and are higher than totals in summary tables

Construction Impacts

Direct, short-term construction impacts associated with Alternative 3 include 39.6 acres of potential wetland impacts. Twenty-two of these 39.6 acres are associated with widening of SR 167. General purpose lanes, arterial HOV, connecting freeway capacity, and committed arterial improvements associated with I-405 represent an additional 12.6 acres of impact. Some of these impacts may be avoidable through engineering design refinements and through minimization, to be pursued during project-level design. The number of projects proposed under this alternative is relatively high, and there is the potential for impacts during construction. This impact is about equal to that expected for Alternative 4.

Only a few road projects within this alternative have the potential to substantially alter wetland buffers. Widening SR_167 from I-405 to the study boundary has the most potential to alter wetlands/wetland buffers. Overall, wetlands impacts associated with Alternative 3 could result in similar wetland impacts to those of Alternative 4 (Table 3.6-5).

Most of the wetland impacts associated with this alternative are associated with expansion/widening of existing roads. New construction would affect 44 wetlands, while 100 wetlands would be impacted by construction along existing roads. The HCT proposed in this alternative (BRT) would operate on the existing roadway and potentially impact no wetlands. The potential for this alternative to fragment wetland habitat is consequently moderate to high, while opportunities to avoid wetlands by realigning proposed roads are few. New impervious surface would increase by 773 acres under this alternative. _This large area would create an associated increase in sedimentation and contamination from runoff less than that created by Alternatives 2, 4, and the Preferred Alternative, but high compared to Alternative 1 and the No Action Alternative.

Operational Impacts

Impacts associated with an increase in impervious surface could result in increased hydrologic changes to wetlands in the study area. Because of the close proximity of riverine wetlands adjacent to the Black River/Springbrook Creek system, water quality and quantity impacts associated with this alternative may be higher than alternatives that do not include widening of SR 167. Project-level design aimed at minimizing impacts, retention and detention of stormwater implemented at the project level, and retrofitting of existing facilities would help minimize impacts to functions within wetlands.

Functional Evaluation. Impacts to the Black River Basin would be similar to impacts that would occur in Alternative 2. Nearly 48 percent of the acreage impacted is HP wetlands, occurring mostly in the Black River Basin and some in North Creek Basin. Within the Black River Basin, approximately 25 acres of impacts to wetlands and 37 acres to buffers would occur as a result of the Alternative 3 improvements. None of the wetlands within the Black River Basin are designated Riverine by the USFWS classification system. Because of the higher amount of impact to wetlands within the Black River Basin, functional impacts to wetlands would tend to be high.

3.6.4.5 Alternative 4: General Capacity Emphasis

Alternative 4 includes increasing general purpose and HOV capacity, widening of SR 167 from I-405 to the study area boundary, but fewer new transit facilities and local bus service improvements than the other action alternatives. An increase in general purpose and HOV capacity would be created by adding one lane in each direction along I-405, a new four-lane I-405 express roadway, and other general purpose and HOV improvements along the I-405 corridor. This alternative does not include the HCT that accounted for numerous wetland impacts in the other action alternatives. A detailed description of improvements associated with Alternative 4 is provided in Section 2.2.5, and Figure 2.2-5 depicts the location of these improvements.

Alternative 4 could result in 39 acres of impact to wetlands in the study area, including approximately 18 acres of impact to HP wetlands (Table 3.6-5). The total number of acres impacted by this alternative is very similar to Alternative 3, less than Alternative 2, but more than Alternative 1, the Preferred Alternative, and the No Action Alternative. Ninety-six wetland complexes and 36 HP wetland complexes could be impacted by this alternative. Furthermore, Alternative 4 would result in 1,061 acres of new impervious surface, the highest of any alternative under consideration. Wetland and their buffer impacts occur mostly in the Black River, North Creek, and Sammamish River basins. Similar to Alternatives 2 and 3, the cities of Kent, Renton, and Bothell have the highest numbers and acres of unique wetlands impacted under this alternative.

The total number of impacts to wetlands presented in Table 3.6-14 is higher than previous tables because in some cases multiple types of improvements caused multiple counts of the same wetland. Totals shown on Table 3.6-14 represent the total number of times wetlands are impacted and not the total number of wetlands impacted.

Table 3.6-14: Alternative 4 Impacts

Type of Improvements	Potential Impacts to Wetland Complexes	Potential Impacts to HP Wetlands	Acres of Impact
Arterial Capacity	16	10	2.4
Arterial Interchange	5	3	0.4
Basic Improvements	11	5	1.8
Committed Arterial	18	8	2.4
Connecting Freeway Capacity	15	4	3.7
General Purpose Lane	17	7	2.7
HOV Ramps	2	0	< 0.5
I-405 Crossings & Ped/Bicycle	10	7	1.4
Planned Arterial	8	4	1.9
Widening of SR 167	18	5	22.3
Alt. 4 Total Impacts [a]	120	53	39.0

[a] Totals include wetlands impacted by more than one type of improvement and are higher than totals in summary tables

Construction Impacts

Direct, short-term construction impacts associated with Alternative 4 are similar to those of the other alternatives and include 39 acres of potential wetland fill. As was the case with Alternative 3, approximately 22 acres of impact could occur as a result of widening SR 167. Most of the remaining impacts are included within the various improvements associated with I-405. Several of these projects have the potential to impact wetland buffers. This is especially true within the Black River, North Creek, and Sammamish River basins. Overall, approximately 83 acres of wetland buffer could be impacted by Alternative 4 (Table 3.6-7).

Only a few road projects within this alternative have the potential to alter wetland buffers. Widening I-405 in each direction and widening SR 167 from I-405 to the study boundary have the most potential to alter wetlands/wetland buffers.

Operational Impacts

Alternative 4 would result in the greatest increase in new impervious surface of all the alternatives (1,061 acres). Because this alternative has the highest increase in new impervious surface, there is a corresponding potential increase in sedimentation and contamination. While this increase in impervious surface would require storm drainage mitigation to avoid downstream impacts to wetlands, it is more than five times the impervious surface of the No Action Alternative and could result in far greater impacts than all other alternatives.

Functional Evaluation. Impacts from Alternative 4 to Big Bear Creek, Juanita Creek, Lower Cedar River, Lower Green River, May Creek, Sammamish River, and Swamp Creek basins would be similar to the impacts that would occur in Alternative 1. Impacts to functions within the Black River and Little Bear Creek basins would be similar to impacts in Alternative 2. Within Kelsey Creek and Soos Creek basins no wetlands are impacted by Alternative 4. Therefore, no impacts to wetland functions within these basins would result from Alternative 4. Impacts to wetland functions within the North Creek and Mercer Slough basins would be similar to impacts that could occur in Alternative 3. Project-level design aimed at minimizing impacts, retention and detention of stormwater implemented at the project level, and retrofitting of existing facilities would help minimize impacts to functions within wetlands.

3.6.4.6 Preferred Alternative

The Preferred Alternative includes many aspects of the other alternatives, but is most similar to Alternative 3. It includes a BRT system instead of the fixed-guideway system proposed in Alternatives 1 and 2. It also includes expansion of local bus transit, two additional lanes in each direction on I-405, arterial capacity and connectivity improvements, and the other general purpose and HOV improvements associated with the other alternatives. It includes expansion of the SR 167 and I-405 interchange. State Route 167 would be widened by up to two lanes in each direction south from I-405 to South 180th Street with no widening beyond that limit. The reduction in total length of widening of SR 167 under the Preferred Alternative is a primary factor in the reduction of wetland impacts under the Preferred Alternative compared to the widening under Alternatives 3 and 4. Another important element responsible for the reduction of wetland impacts under the Preferred Alternative is that it does not include the fixed-guideway HCT system that accounted for 16.7 acres of impact under Alternative 2. Section 2.2.6 contains a detailed description of the actions associated with the Preferred Alternative, while Figure 2.2-6 depicts the locations of the proposed improvements.

The Preferred Alternative could result in approximately 25 acres of impact to wetlands in the study area, including approximately 13 acres of impact to HP wetlands. The total acres of wetlands impacted are less than all other action alternatives. Eighty-five wetland complexes and 36 HP wetland complexes could be impacted by this alternative. Furthermore, the Preferred Alternative would result in 974 acres of new impervious surface, the second highest of any alternative under consideration. Wetland and buffer impacts occur mostly in the Black River, North Creek, and Sammamish River basins. The cities of Renton and Bothell have the highest numbers and acres of unique wetlands impacted under this alternative.

The total number of impacts to wetlands presented in Table 3.6-15 is higher than previous tables because in some cases multiple types of improvements cause multiple counts. Totals indicated in Table 3.6-15 represent the total number of times wetlands are impacted and not the total number of wetlands impacted.

Table 3.6-15: Preferred Alternative Impacts

Type of Improvements	Potential Impacts to Wetland Complexes	Potential Impacts to HP Wetlands	Acres of Impact
Arterial Capacity	16	12	2.6
Arterial HOV	10	4	2.1
Arterial Interchange	3	1	0.2
Basic Improvements	2	1	0.2
Committed Arterial	19	8	2.4
Connecting Freeway Capacity	12	4	3.9
General Purpose Lane	18	6	3.4
HOV Ramps	2	0	0.0
I-405 Crossings & Ped/Bicycle	14	10	1.9
Widening of SR 167	2	2	6.7
Planned Arterial	8	4	1.7
Preferred Alternative Total Impacts[a]	106	52	24.9

[a] Totals include wetlands impacted by more than one type of improvement and are higher than totals in summary tables

Construction Impacts

Direct, short-term construction impacts associated with Preferred Alternative are less than those of the other alternatives and include 24.9 acres of potential wetland fill. The Preferred Alternative would result in fewer acres of wetland impacts than all other alternatives except the No Action Alternative. This is a direct result of limited widening of SR 167 and exclusion of the fixed-guideway HCT system in this alternative.

Construction-related impacts are relatively well distributed among the various types of improvements associated with this alternative. However, based on acres of impact, connecting freeway capacity would impact 10.6 acres out of a total of 24.9 acres of total wetland impacts. As was the case with all alternatives, wetland impacts are primarily associated with construction activities within the Black River, North Creek, and Sammamish River basins (Table 3.6-8).

The Preferred Alternative would also have the least quantity of buffer impacts compared with the other alternatives. Overall, 60.9 acres of wetland buffer could be impacted by the Preferred Alternative (Table 3.6-7). Some of these impacts may be avoidable through engineering design refinements and through minimization. All appropriate minimization strategies would be pursued during project-level design.

Operational Impacts

Operational impacts on wetlands would be slightly less than those associated with Alternative 4, but greater than the other alternatives based on the quantity of new impervious surface. The Preferred Alternative could result in 974 acres of new impervious surface. As was the case with the other alternatives, stormwater runoff would be the greatest single operational impact to wetlands under the Preferred Alternative.

Functional Evaluation. Impacts from the Preferred Alternative to Big Bear Creek, East Lake Washington, Juanita Creek, Lower Cedar River, Lower Green River, Sammamish River, Soos Creek, and Swamp Creek basins would be similar to the impacts that would occur in Alternative 1. Approximately 9.34 acres of wetland within the Black River Basin would be potentially impacted by the Preferred Alternative improvements. These impacts are less than in Alternatives 2, 3, and 4, but more than in the No Action and Alternative 1. It is expected that functional impacts to wetlands within the Black River Basin would be greater than in the No Action Alternative and Alternative 1, but less than in Alternatives 2, 3, and 4. Functional impacts within the Little Bear Creek and May Creek basins would be similar to those occurring as a result of the Alternative 2 improvements. Impacts to wetland functions within the Mercer Slough and North Creek basins would be similar to impacts that would occur from Alternative 3. Project-level design aimed at minimizing impacts, retention and detention of stormwater implemented at the project level, and retrofitting of existing facilities would help minimize impacts to functions within wetlands.

3.6.5 Mitigation Measures

3.6.5.1 General Mitigation

The purpose of mitigation is to offset unavoidable impacts and ensure that no net loss of wetland area, function, or value occurs as a result of the proposed action. The sequential steps generally taken in the mitigation process are:

- Avoiding impacts.
- Minimizing impacts.
- Restoring the impacted environment.
- Reducing impacts over the life of the project using preservation and maintenance operations.
- Compensating for adverse impacts by replacing the affected environment or providing substitute resources.
- Monitoring the impacted environment and taking appropriate corrective measures as needed.

Because wetland functions generally vary between HP and LP wetlands, mitigation needs also vary. HP wetlands generally require greater mitigation than LP wetlands. Implementing mitigation prior to wetland disturbance may help minimize temporary losses of wetland functions, although it may take 10 or more years for wetlands to mature enough to fully replace lost functions.

While impacted wetlands within the study area may not provide all of their historic functions, they remain a valuable and sometimes irreplaceable resource. Because of this, the focus during project design and any early-action mitigation will be to implement the aforementioned sequential steps for all wetlands regardless of a wetland's priority status (HP or LP).

Frequently, the relationship between wetland area and habitat value is non-linear. Thus, the impact of filling could vary depending on the size and quality of the original wetland, the relationship of the mitigation to the original wetland, and the surrounding habitat. Wetland mitigation sites frequently have initially lower habitat values than natural systems, as forested wetlands may take 80 or more years to reach maturity and provide their full potential functions. Wetland mitigation often occurs at a ratio greater than 1:1 to compensate for this inequality. Mitigation ratios vary by jurisdiction, responsible agency, and construction-impact timing. They range from 1:1 to 6:1 or greater replacement ratios. Should wetland mitigation use generic ratios rather than incorporating functional assessment strategies, mitigation sites may not provide the same functions and values as those destroyed. Project-level design or early-action mitigation will consider these factors to assure that the appropriate mitigation approach is implemented. Advanced mitigation will be implemented prior to wetland impacts where feasible, to reduce temporary losses of wetland functions (see Appendix J).

Sufficient property is anticipated to be available within the study area for mitigation. In some highly developed watersheds, suitable vacant parcels available for mitigation may be rare. Identification of available parcels for mitigation will be dependent upon specific real estate conditions and will be undertaken during project-level analysis. Mitigation sites should provide connectivity with the remaining wetlands within the basin whenever possible, although isolated wetlands in highly developed areas are not without value, as they provide habitat for urban wildlife. Finding non-wetland property in proximity to a suitable hydrologic source will be increasingly difficult under increased development pressure. In some instances, out-of-kind watershed restoration may provide adequate or even higher levels of wetland/watershed functions than in-kind wetland replacement. While out-of-kind restoration is a potential option for each alternative being analyzed, its value would be assessed on a case-by-case basis.

Mitigation banking will be an option where on-site mitigation is not possible or is less environmentally beneficial. Mitigation banking would allow acquisition of credits, which go toward enhancing, creating, or restoring wetlands at a designated site. Once the wetland is created and functioning, these credits would compensate for unavoidable wetland impacts. The bank creators, or sponsors, assume responsibility for maintaining the wetlands in perpetuity, or they could sell the site to another owner, who would then assume responsibility. Banking may only occur if the wetland impacts could not be avoided or minimized to an acceptable level on-site.

Regional wetland mitigation facilities may have the potential to improve many wetland functions, particularly fish-rearing habitat, peak flow attenuation, large habitat areas with limited disturbance and edge area, and low flow augmentation. Because of the typically large number of oftentimes-small wetland impacts associated with linear transportation projects, there may exist the opportunity for regional wetland restoration or enhancement. However, the specific functions appropriate for restoration and/or enhancement would depend upon the particular mix of transportation elements and projects chosen as the preferred alternative. Combining such impacts into a few regional restoration projects may not be practicable. Opportunities for restoration are highly site-specific, depending greatly upon the functions provided by the existing watershed conditions, and thus specific parcels for wetland restoration or mitigation have not been identified.

This early analysis assumes that avoiding wetlands altogether is the first step in the mitigation process. Project-level impact analysis will evaluate how some operational impacts will be mitigated. For instance, road impacts to wetlands may be avoided or minimized by using methods other than widening at the surface (e.g., stacking lanes or tunneling) where practicable to increase capacity in the vicinity of environmentally sensitive or important areas. Measures to avoid and minimize increases in impervious surfaces and increased stormwater runoff, in order to avoid altering wetland hydrology in downstream reaches, will be incorporated through project-level design where practicable.

Some typical avoidance measures to be contemplated include:

- Using or lengthening bridges to cross streams and their associated riparian corridors and wetlands;
- Using retaining walls to reduce or eliminate lateral extensions of road embankment slopes into wetlands;
- Using guardrails to increase the grade of embankments and avoid wetland fill;
- Stacking lanes or constructing viaducts; and
- Constructing tunnels.

Best management practices (BMPs) will be used to minimize short-term sedimentation and contamination. These practices will include sediment fences, check dams, temporary seeding, mulching, jute netting, phased construction, and/or construction during less sensitive seasons where appropriate. Stormwater treatment facilities will be designed consistent with Ecology's Stormwater Manual or functionally equivalent stormwater guidance, such as WSDOT's highway runoff manual.

Mitigation locations and concepts will be identified during the permitting for specific projects and during possible early-action mitigation activities (see Appendix J of the FEIS). WSDOT has met and will continue to meet with state and local agencies to identify mitigation priorities and options, and to discuss opportunities for on-site mitigation and mitigation banking.

Another option that could be utilized on a case-by-case basis is replacing lower value roadside emergent wetlands with high-value streamside wetlands. Although roadside wetlands provide water quality, groundwater recharge, and stormwater retention functions, replacing them at high ratios would not always be advantageous. Many of these roadside wetlands are dominated by invasive species such as reed canarygrass and can successfully and quickly be replaced (unlike forested wetlands). Since the availability of streamside wetlands that provide refugia for salmonids is often a limiting factor in Puget Sound Lowland streams, shifting part of the mitigation ratio to high-value wetlands that provide other critical functions may be a viable option in some cases. An example of such a scenario is if 1 acre of roadside emergent wetlands was to be filled and the mitigation ratio was 2.5:1. Under this scenario, 2.5 acres of new roadside emergent wetlands could be required to mitigate for the impacts. However, the roadside emergent wetland could be replaced at a 1:1 ratio, with the remaining 1.5 acres of mitigation going toward addressing other basin needs. In this scenario 1.5 acres of streamside wetlands could also be created. WSDOT is currently working on an *Early-Action Environmental Impact Mitigation Decision-Making Process* that will help define a process to help guide the mitigation process and align WSDOT mitigation needs with various watershed and salmonid recovery needs (see Appendix J).

3.6.5.2 Specific Mitigation

Specific mitigation can not be defined at the programmatic level of analysis. This is a result of uncertainties in the actual amount and type of wetland impacts, amount and type of required mitigation, variation in existing opportunities for mitigation in each basin, and early stage of coordination with affected jurisdictions. Furthermore, impact reduction measures to be developed during the project design phase will reduce the amount of required mitigation.

Although the specific method or acreage of mitigation can not yet be defined, it could fall within the range of existing mitigation ratios defined by various jurisdictions in the study area (Table 3.6-16). Furthermore, site-specific surveys conducted during the project-level design phase will probably document wetlands currently not contained within existing databases used for analysis during this programmatic-level review. Although the final acreage of wetland impacts and required mitigation is uncertain, Table 3.6-16 below presents some possible ranges of mitigation based on the existing information. Since replacement ratios vary by jurisdiction, wetland type, and mitigation approach, the following estimates provide a range. Some local jurisdictions do not have specific mitigation ratios within their codes, but rely on either King County or Ecology for guidance. For informational purposes, the following Table 3.6-16 includes mitigation ratios required by each jurisdiction as well as Ecology's anticipated maximum ratio of 12:1.

Table 3.6-16: Summary of Potential Mitigation Ratios by Jurisdiction

Jurisdiction	Wetland Impacts of Preferred Alternative	Minimum Mitigation Ratio	Required Mitigation Based on Minimum Ratio	Maximum Mitigation Ratio	Required Mitigation Based on Maximum Ratio	Acres of Mitigation Based on 12:1 Mitigation Ratio
Bellevue	0.3 acre	1.5:1	0.5 acre	2:1	0.7 acre	4.1 acres
Bothell	7.5 acres	1.25:1	9.4 acres	2:1	15. acres	90.2 acres
Kenmore	0.0 acre	1:1	0.0	2:1	0.0	0.0
Kent	0.0 acre	1.5:1	0.0	3:1	0.0	0.0
King County	1.4 acre	1:1	1.4 acres	2:1	2.9 acres	17.3 acres
Kirkland	0.1 acre	1.25:1	0.1 acre	6:1	0.3 acre	0.5-acre
Newcastle	0.4 acre	1.25:1	0.5 acre	12:1	4.6 acres	4.6 acres
Redmond	1.1 acre	1:1	1.1 acre	6:1	6.5 acres	13.0 acres
Renton	10.1 acres	1.5:1	15.1 acres	6:1	60.3 acres	120.6 acres
Snohomish County	1.9 acres	1:1	1.9 acres	1:1	1.9 acres	23.0 acres
Tukwila	0.4 acre	1.5:1	0.7 acre	6:1	2.6 acres	5.3 acres
Woodinville	1.7 acre	1:1	1.7 acre	2:1	3.5 acres	20.9 acres
TOTALS	24.9 acres	N/A	32.4 acres	N/A	98.3 acres	299.0 acres
Ecology	24.9 acres	1.25:1	31.1 acres	6:1	149.4 acres	299.0 acres

Based on the results presented in Table 3.6-16, 25 acres of impacted wetlands could be replaced by as much as 300 acres of new wetlands. However, the actual amount of compensation would likely fall within a range between 33 and 300 acres, depending upon the types of wetlands impacted and final compensation ratio.

An integral part of mitigation is the replacement of lost wetland functions. Forested wetlands (PFO) are typically of the highest value and most difficult to replace, and therefore require higher compensation ratios. Emergent wetlands (PEM) are typically of lower value and are more easily replaced, and therefore require smaller compensation ratios.

The wide array of potential mitigation and compensation strategies would include long-term monitoring to ensure success. Monitoring typically spans 3 to 10 years and is necessary to assure the achievement of mitigation goals and objectives. The implementation of contingency plans is required when mitigation goals are not achieved. Furthermore, wetlands created or enhanced as part of the mitigation process would be protected in perpetuity through binding covenants, easements, or other mechanisms that follow the title of the property.

WSDOT will develop a mitigation plan for the I-405 corridor for resources protected and regulated by federal, state, and local jurisdictions. It will be consistent with the proposed early-action environmental impact mitigation decision-making process presented in Appendix J. The plan will be developed based on a 5 percent design level prior to permitting individual projects. The plan will include a more detailed analysis of project impacts and an analysis of mitigation opportunities, first on-site, second within the same sub-basin, and third within the same watershed (i.e., in the water resource inventory area [WRIA]) in order to find the most appropriate or best mitigation opportunity for each impact. Off-site and out-of-kind mitigation opportunities will be evaluated in accordance with the Alternative Mitigation Policy Guidance Interagency Implementation Agreement (included in DEA, 2002) adopted on February 14, 2002 by WSDOT, Ecology, and the WDFW to supplement in-kind, on-site opportunities.

WSDOT anticipates that it may not be possible nor most beneficial to the natural environment to mitigate all project impacts within the same sub-basin where the impact occurs. While the mitigation will be analyzed at various levels, it will be implemented at the most appropriate level to maximize environmental benefit in a cost-effective manner. For example, WSDOT may mitigate for lost wetland function and acreage through a combination of opportunities that involves on-site, in-kind mitigation within the sub-basin of impact and off-site mitigation in other sub-basins within the same watershed. The goal is to integrate transportation and environmental investments in a way that improves critical natural resources and supporting habitat, while ensuring that transportation funds are spent on the greatest environmental benefit.

All alternatives are likely to result in unavoidable impacts to wetlands and to streams/riparian areas, and increase impervious surface area. The major projects likely to impact aquatic resources are the addition of one general purpose lane in each direction along I-405 and the arterial projects. Figure 3.6-2 shows an overlay of the I-405 elements relative to stream basins and wetlands and Figure 3.6-3 shows an overlay of the arterial projects relative to the stream basins and wetlands. These overlays generally show where the addition of lanes along I-405 and the arterial projects intersect with the identified wetlands and streams within sub-basins within the I-405 Corridor Program study area. The following paragraphs discuss mitigation for all aquatic resources as an overall perspective. Sections 3.8 and 3.5 present other mitigation for streams and surface water.

Impacts to aquatic resources would occur within WRIA 8, which contains 22 sub-basins, and WRIA 9, which contains 4 sub-basins. The sub-basins within WRIA 8 where the majority of aquatic impacts to wetlands and riparian/stream habitats are likely to occur are the Sammamish River and North Creek sub-basins, and in WRIA 9 the Black River sub-basin. Table 3.6-17 summarizes the aquatic resource impacts of the Preferred Alternative in these sub-basins.

Table 3.6-17: Summary of Resource Impacts of the Preferred Alternative on WRIA 8 and 9

Sub-basin	Wetland Acreage	Number of Riparian/Stream Encroachments	Impervious Surfaces (acres)
Black River	9.3	21	142
North Creek	6.4	21	141
Sammamish River	3.3	129	110
Total of Sub-basins	19.1	171	393
Total of Preferred Alternative and No Action Alternative	25	330	974
Sub-basins as Percent of Total	76%	52%	40%

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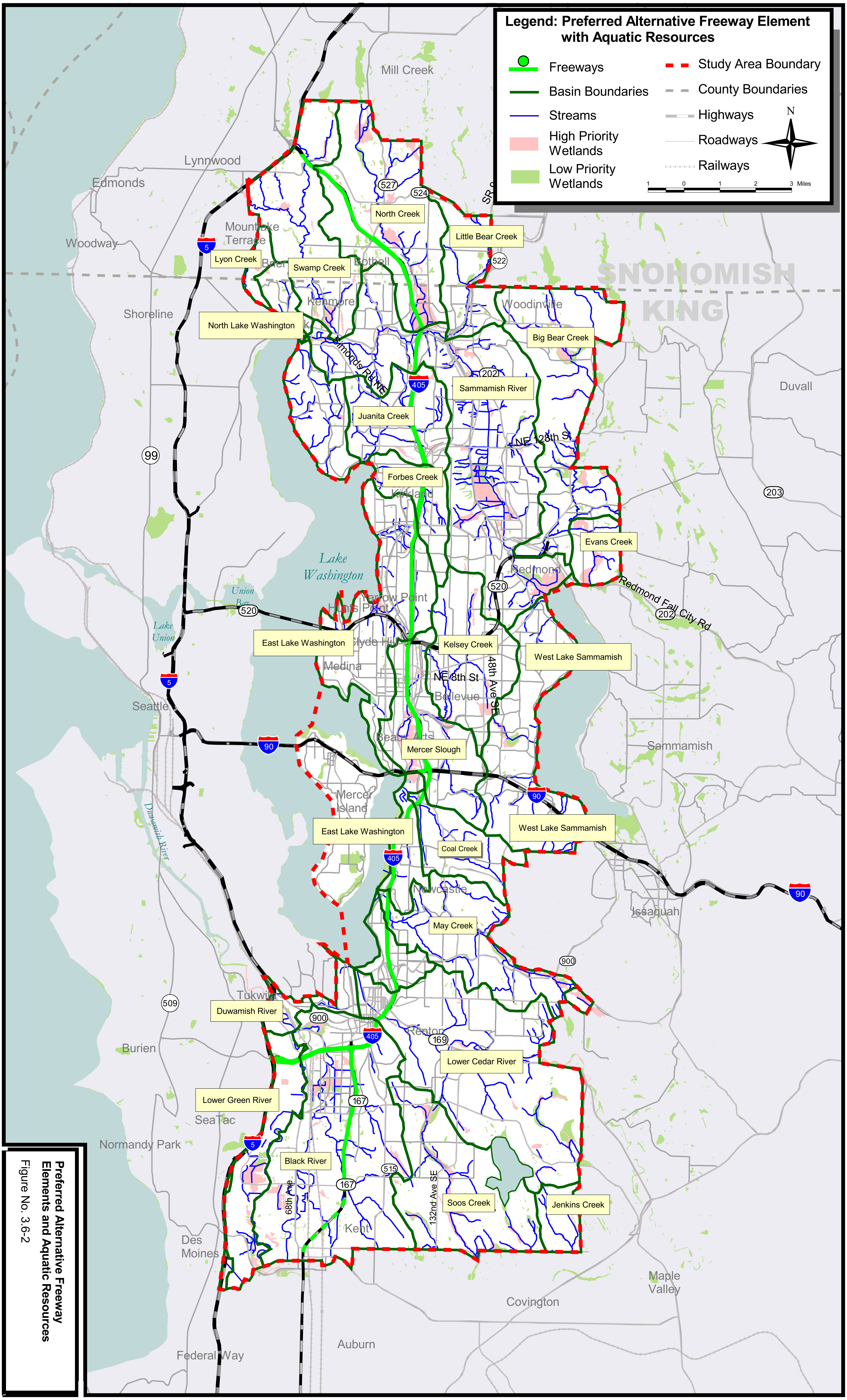

Preferred Alternative Freeway Elements and Aquatic Resources

Figure No. 3.6-2

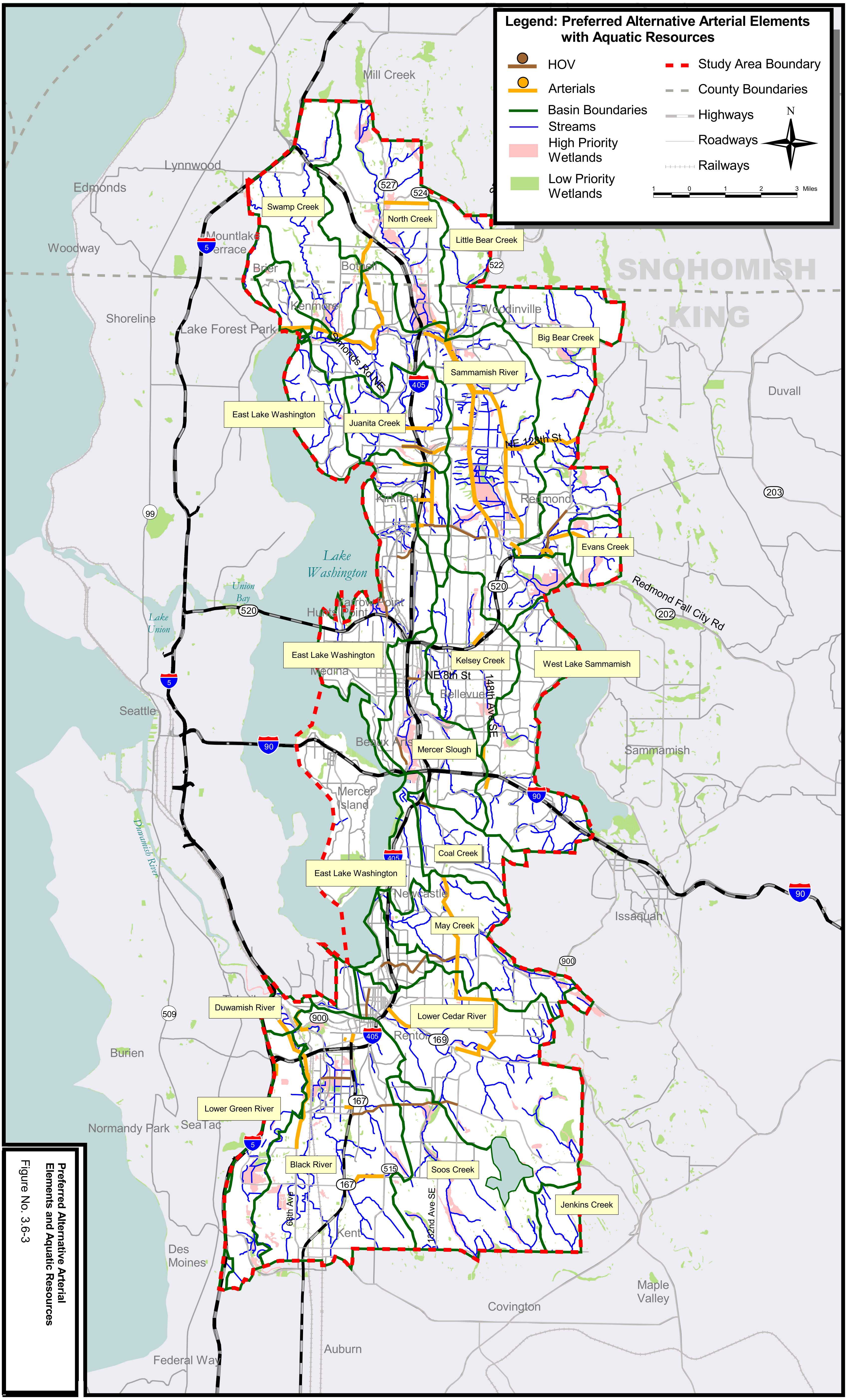

Figure No. 3.6-3

Preferred Alternative Arterial Elements and Aquatic Resources

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Section 3.5.5 of the EIS identifies mitigation measures related to surface water and groundwater applicable to all alternatives, and identifies mitigation measures specific to sub-basins and alternatives. The surface water and groundwater mitigation measures apply primarily to basin base flows, which are important to fish and wildlife resources.

Section 3.8.5 of the EIS identifies mitigation measures related to fisheries and aquatic habitat – primarily riparian and stream encroachments – that apply to all alternatives. During development of the EIS, WSDOT met with basin stewards to obtain information on fisheries and aquatic mitigation opportunities within the sub-basins. Section 3.8.5.2 identifies mitigation opportunities within each sub-basin, which demonstrates that there is a broad range of available and sufficient mitigation opportunities within each sub-basin to offset unavoidable impacts. These will be further quantified at the project-level design stage. Information contained in Section 3.8.5.2 of the EIS along with other mitigation measures that will be identified as part of the WRIA planning efforts can be used to identify mitigation opportunities at the sub-basin, cross-basin, and WRIA levels.

Similarly, Section 3.6.5.1 identifies general mitigation measures to offset unavoidable impacts to wetlands that apply to all of the alternatives and each sub-basin. More detailed information will be developed to identify specific projects that will impact specific wetlands as the project transitions from the program level to the project-level design stage. There is limited ability to identify specific wetland mitigation opportunities within each sub-basin at the program level because:

- On-the-ground, site-specific surveys are needed to document wetlands that are currently not contained within the databases used during the program-level review.
- General wetland impacts have been identified (see Figures 3.6-2 and 3.6-3) but specific information on wetland types and functional impacts is not available for the program-level review.
- The necessary level of detail on available wetland mitigation opportunities within the sub-basins to correlate with project-specific impacts is either not available or is in various stages of development.
- Only general acreage of wetland mitigation opportunities is available to correlate with the estimated impact acreage to specify whether there is sufficient opportunity within a sub-basin to mitigate impacts.
- No detailed evaluation of mitigation site opportunity (ownership, costs, permitting, etc.) has been conducted.
- The level of design detail for the projects is sufficient to overlay on the existing information on wetlands, but it is not sufficient to determine if impacts can be or will be avoided.

Despite these limitations, the following is a discussion of an approach to developing a wetland mitigation strategy within each sub-basin at the project-level design stage. This effort will be done in coordination with the regulatory agencies and in coordination with the WRIA planning groups so that an integrated mitigation approach (e.g., mitigation within a sub-basin, mitigation across sub-basins, mitigation out-of-basin within the WRIA) is developed and implemented within the I-405 study area.

To illustrate this strategy and approach, three sub-basins are discussed in more detail: Black River, North Creek, and Sammamish River. These three sub-basins are discussed because over 75 percent of all wetland impacts occur within these sub-basins, and with the exception of the Sammamish River sub-basin, there is generally more information available on wetland mitigation opportunities. This information suggests whether there are sufficient mitigation opportunities to compensate for unavoidable wetland impacts within the sub-basin and whether compensatory wetland mitigation opportunities are limited within a sub-basin, and helps to identify targeted mitigation opportunities. For example, WSDOT collected numerous data on the I-405/SR 167 interchange project and used the information to develop an Example Project Environmental Analysis to demonstrate an approach to a mitigation strategy. This approach includes identifying and analyzing impacts and identifying mitigation opportunities within the Black River sub-basin. The strategy and approach identified below are applicable to all sub-basins during the project-level design stage.

Black River Sub-Basin

The mitigation approach used for the I-405/SR 167 interchange project (from the BNSF railroad crossing at I-405 [MP 1.2] to the I-405/SR 169 interchange [MP 4.0] and south of SR 167 to SE 180th Street interchange [MP 24.4]) is summarized below to illustrate the mitigation approach that WSDOT can undertake within the Black River sub-basin and that can be adapted to use in all of the sub-basins within the I-405 study area.

The approach was divided into four steps:

1. Evaluate mitigation opportunities on-site, off-site, and out-of-kind based on watershed priorities that address specific habitat impacts.
2. Quantify impacts to wetlands, fish and aquatic habitat, floodplains, water resources (surface water and groundwater), and upland protected species.
3. Estimate impacts based on conceptual design drawings and aerial photographs. During the project-level design stage resource boundaries will be delineated and surveyed.
4. Identify avoidance and minimization measures.

An impact matrix was prepared with Resources and Functions in the first column, and column headings across the matrix of Baseline Conditions, Impacts from Project, On-site Minimization Measures, and Potential Compensatory Measures.

Fish and aquatic resource functions were derived from the NMFS Pathways and Indicators Analysis (NMFS, 1996). Wetland functions were derived from WSDOT's Best Professional Judgment Tool (WSDOT, 2000). Floodplains were derived by FEMA maps, and functions included storage capacity, floodway conveyance, and floodplain connectivity. Water resource functions included temperature, turbidity, chemical contamination, change in peak or base flows, and groundwater exchange. Protected upland species information was derived from the WDFW PHS database, and functions included habitat for birds, mammals, native plant richness, educational values, and uniqueness and heritage value.

A GIS database provided the locations of the resources. Limited field work (e.g., drive-by) confirmed the presence or absence of a resource, after which the Baseline Conditions column was completed. At the project level, additional field work will be conducted to more accurately define and delineate resources.

Conceptual design drawings and aerial photographs were reviewed to define impacts and to input data into the Impacts from Project column of the matrix.

Based on the identified impacts, the conceptual level drawings were used to identify avoidance and minimization measures to complete the Minimization Measures column of the matrix.

Opportunities to compensate for unavoidable impacts were identified by interviewing local, state, and federal agencies, from existing published data on mitigation sites, and from unpublished lists prepared as part of the current WRIA planning efforts. During the project-level design stage, WSDOT will work with the regulatory agencies and the WRIA planning groups to identify mitigation opportunities that can be implemented on the sub-basin level, across sub-basins, and/or within a WRIA.

Based on the analysis conducted for the I-405/SR 167 interchange project, site-specific and basin-wide mitigation opportunities were identified that addressed all of the resources and functions used in the impact matrix. Although mitigation opportunities were identified that addressed all the resources and functions in the impact matrix, only sub-basin wetland opportunities are identified below to illustrate how the results of this analysis can be used to address unavoidable wetland impacts in the Black River sub-basin, and to demonstrate that for the anticipated 9.34 acres of wetland impact under the Preferred Alternative, there appears to be sufficient mitigation opportunities within the sub-basin. These opportunities include:

- Create wetland within the cloverleaf;
- Provide enhancement of low quality wetlands A2 and C2;
- Create and restore wetland along Springbrook Creek;
- Fund a wetland mitigation bank near Oakesdale Avenue and SW 34th Street;
- Acquire Seattle Times site near SW 34th Street for wetland creation;
- Enhance the Elliot Wetland;
- Enhance the wetland and stream habitat at Lower Jones Road;
- Enhance wetland 103;
- Create two groundwater-fed ponds near wetland 37D and extend an outlet channel to the wetland;
- Enhance wetland 132 by increasing structural diversity and creating fish-useable habitat;
- Enhance the wetland at Dorre Don Court;
- Enhance wetland 70; and
- Develop mitigation design for wetland drainage problems between Panther Creek and Springbrook Creek.

When these wetland mitigation opportunities are considered in concert with the many other mitigation opportunities targeted at the other resources and functions evaluated, an integrated mitigation approach can be implemented to offset impacts in the Black River sub-basin and maximize benefits to aquatic resources.

North Creek Sub-Basin

The North Creek sub-basin crosses the King-Snohomish county line north of Bothell and south of Mill Creek and includes the northerly portion of I-405, SR 527, and SR 524. It drains an area of approximately 29 square miles. North Creek originates near the Everett Mall and flows south to the Sammamish River.

Projects presented in the Preferred Alternative within the North Creek sub-basin that may impact wetland and other aquatic resources include:

- Freeway expansion (add up to 2 general purpose lanes in each direction on I-405, provide collector-distributor lanes);
- Connecting freeway expansion from SR 522 to NE 195th;
- Arterial capacity and connectivity expansion at SR 527 from SE 228th Street through the I-405 interchange;
- Arterial expansion in the form of widening the lanes to include sidewalks and bike lanes from 24th street SW to SR 527;
- Capacity expansion on north-south arterials by widening one lane in each direction;
- Upgrade of arterial connections to I-405;
- Bus rapid transit stations at Canyon Park and the Bothell/UW campus in Bothell;
- HOV express access on I-405 with direct access ramps in the vicinity of NE 195th Street (Bothell/UW campus) and SR 527;
- Additional park-and-ride capacity at Canyon Park (between I-405 and SR 527); and
- Additional transit center capacity at Canyon Park.

About 6.4 acres of wetland impact are anticipated from projects in the North Creek sub-basin. Possible mitigation opportunities related to surface waters and fisheries within the North Creek sub-basin are identified in Sections 3.5.5, 3.8.5, 3.8.5.1, and 3.8.5.2 of the EIS. In addition to the possible actions identified in those sections, Snohomish County and WSDOT (Snohomish County PWD, and WSDOT 2000) identified 22 possible aquatic habitat mitigation sites.

The North Creek sub-basin has sites large enough to develop wetland mitigation banks. Within the North Creek sub-basin, about 132 acres were identified that could be used for wetland preservation (38 acres), wetland enhancement (57 acres), wetland creation (20 acres), riparian enhancement (4.5 acres), wetland buffer enhancement (5.3 acres), stream restoration (2 acres), and wetland restoration (4.4 acres). Some specific high-priority opportunities identified by Snohomish County and WSDOT (Snohomish County PWD and WSDOT, 2000) include:

- A site off 35th Avenue SE and south of 132nd Street SE where hog fuel and organic debris have been dumped for several years. The site is bordered on the south and east by existing shrub wetlands and to the west is a 4-acre open water wetland mitigation site. The site is adjacent to Penny Creek, a tributary to North Creek. Mitigation opportunities at this site include up to about 2 acres of wetland creation or restoration and buffer creation.

- There is a multi-parcel site (approximately 25 acres) located north of the North Creek County Park that consists of a large wetland and pasture complex dominated by invasive species. A portion of the site is used for horse pasture and residences also occur on the site. North Creek and Penny Creek border the site. Opportunities at this site include wetland restoration and enhancement and riparian enhancement that would interconnect to another wetland complex to the south.
- A third site located on 180th Street SE, east of 35th Avenue SE, is about 5 acres in size and contains patches of wetland vegetation intermixed with upland pasture grasses. This site provides an opportunity for wetland creation/enhancement and riparian and stream restoration along Tambark Creek, which flows along the site's western border. South of this site is a large wetland complex that receives high amounts of wildlife usage. Created wetlands in this area are expected to reduce flooding, increase stream recharge, and promote wildlife usage.

Based on limited existing information, and taking into account anticipated replacement ratios required to mitigate for wetland impacts, enough acreage appears to be available in the North Creek sub-basin to mitigate for unavoidable wetland impacts as well as impacts to other aquatic resources.

Sammamish River Sub-Basin

The Sammamish River sub-basin extends from just north of the King-Snohomish County line, west towards Lake Forest Park, east to Redmond, and south to the north end of Lake Sammamish. The Sammamish River flows northward and westward from the north end of Lake Sammamish near Redmond to the north end of Lake Washington, and the sub-basin drains about 16,400 acres (25.63 sq miles) within the study area.

Projects presented in the Preferred Alternative that may impact aquatic resources are shown in Figures 3.6-2 and 3.6-3, and are predominantly related to arterial improvements. They include:

- Freeway improvements (add up to 2 general purpose lanes in each direction on I-405, provide collector distributor lanes);
- Widening SR 527 – Bothell Everett Highway;
- Upgrading arterial connections to I-405 from NE 85th to 120th and 228th;
- Adding an arterial HOV at NE 85th from Kirkland Way to 148th Avenue NE;
- Adding one lane in each direction from NE 90th to NE 116th;
- Providing a direct access ramp from SR 522 to the freeway HOV ramps;
- Expanding the capacity from NE 90th to NE 145th;
- Adding transit center capacity;
- Providing a climbing lane from southbound SR 522 to 124th;
- Widening SR 522;

- Constructing new three lane arterial from 132nd to Willows Road exit;
- Constructing new road from NE 124th to NE 145th;
- Widening road between NE 124th and NE 175th on SR 202;
- Constructing new ramp and thru lane at the SR 520/SR 202 interchange;
- Providing access improvements and new freeway ramps at SR 522/SR 202 and SR 522/195th; and
- Adding pedestrian/bike crossing over I-405 and making pedestrian/bike connections between SR 522 and NE 195th and from 228th to 240th.

About 3.34 acres of wetland impact are anticipated from projects developed under the Preferred Alternative in the Sammamish River sub-basin. As stated previously, information on mitigation opportunities in this sub-basin are being developed. Specifically, the Sammamish River Action Plan and the WRIA Early Action Mitigation Studies Plan are expected to provide a valuable source of information that WSDOT will use in implementing a mitigation strategy and approach as defined above under the Black River sub-basin. The 2002 Draft Near-Term Action Agenda for Salmon Habitat Conservation in the Greater Lake Washington Watershed (City of Tacoma, 2002) identifies some wetland opportunities. Opportunities that have been identified include enhancing headwater wetlands on significant tributaries to the Sammamish River and reconnecting existing wetlands to old oxbows or side channels. The final document is expected to identify potential projects, and King County is in the process of completing a wetlands evaluation to identify restoration and enhancement projects.

In summary, WSDOT is committed to a mitigation approach and strategy that is common to all projects (at the 5 percent design level) and that can be used at the sub-basin, cross-basin, and WRIA levels. WSDOT's commitments to the mitigation approach and strategy at the sub-basin level include:

1. Avoiding and minimizing unavoidable impacts during the project design stage.
2. Participating and partnering in the development of WRIA 8 and 9 watershed plans designed for watershed, sub-basin, regional, and segment-scale habitat analyses to focus and prioritize restoration/mitigation efforts aimed at wetlands, fisheries, and water quality. This commitment requires considerable effort to bring together the entities involved in watershed planning to determine the spatial data platforms; the extent of physical, biological, and chemical data for habitat, streams, wetlands, and water quality; data gaps; and the available tools for analyzing habitat conditions and identifying and prioritizing restoration/mitigation efforts.
3. Applying the approach and strategy used for the I-405/ SR 167 interchange project for the Black River sub-basin to other sub-basins.
4. Working with the regulatory agencies to bring the WRIA watershed planning efforts into the sub-basin mitigation approach. For example, as part of the WRIA-based efforts, fish passage barriers were identified in the North Creek sub-basin. One approach WSDOT will use to identify restoration/mitigation projects that benefit fish and aquatic habitat and wetlands is the Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP). SSHIAP is a database of salmon stock and habitat conditions (e.g., stream segments, fish distribution,

fish passage barriers, hydromodifications, riparian/wetland conditions, historic habitat conditions) based on data collected or available for each stream segment. This database can be and has been used to determine which projects within a river/stream system would have the greatest benefit to wild salmon production. Specifically, the SSHIAP data can be used to compare culvert projects relative to the miles open to fish passage based on gradients and lake and wetlands habitat, and relate that information to gains in smolt production. Contrary to intuitive thinking, a culvert project that opens up the most miles to fish passage does not necessarily result in the most benefits to salmon if other culvert projects open up more habitat favorable to spawning and rearing over a shorter distance. This is the type of analysis the SSHIAP database is used for, and is one tool WSDOT will use and incorporate into the mitigation approach to evaluate aquatic restoration opportunities on the sub-basin and WRIA level.

5. Developing a tiered list of restoration/mitigation actions by WRIA and sub-basin.
6. Quantifying unavoidable impacts for the Preferred Alternative. For example, unavoidable wetland impacts would be quantified by a site visit/delineation using the local jurisdiction and/or Ecology manuals to define the size and type of the wetland and the extent of surface area and functional wetland impact.
7. Correlating unavoidable impact area and function to the tiered list of restoration/mitigation actions based on local, state, and federal regulatory standards.
8. Developing a matrix that identifies restoration/mitigation actions that can be implemented within a sub-basin, across sub-basins, or within the overall WRIA consistent with phasing the Preferred Alternative projects, and coordinating this effort with regulatory agencies.
9. Developing and entering into a memorandum of understanding for approval of corridor-level impacts and mitigation actions targeted within a sub-basin, across basins, and/or within the overall WRIA.
10. Applying for regional general permits and other regional approvals as appropriate.
11. Implementing restoration/mitigation actions.

To the extent practical at the programmatic review level, WSDOT has identified opportunities for wetland mitigation (based on limited existing information) in two of the three sub-basins where the majority of wetland impacts occur. It appears that for wetland impacts, there is sufficient opportunity and area within the Black River and North Creek sub-basins to implement wetland mitigation as well as other types of mitigation to offset impacts to other aquatic resources. Developing detailed information on mitigation opportunities within the other sub-basins will require determining the extent and quality of existing information, conducting additional studies, interfacing with local, state, federal, and WRIA planning efforts, and project-level design.

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